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HYPERTROPHIC RHINITIS.

Fig. 1. Portion of middle turbinate, (stained by Haidenhain's haematoxylin and Congo red) showing columnar epithelium overlying a well-defined basement membrane perforated by numerous canals. Below are several glands either serous or resting mucous glands. Below these are a number of active mucous glands filled with secretion. X125 diameter.

Fig. 2. Glands in lower turbinate, essentially normal, stained with Haidenhain's haematoxylin and congo red. On the left are seen two mucous glands in the stage of secretion. Above the center is a mucous gland at rest; below and to the right is a mucous gland on the point of beginning secretion. X200 diameters.

VASOMOTOR RHINITIS.

Fig. 3. Portion of mucous membrane of lower turbinate (stained by Mallory's triple connective tissue stain) showing loose columnar epithelium, overlying a broad basement membrane, the canals of which are crowded with leucocytes, fixed in irregular shapes indicating ameboid motion. X750 diameter.

Fig. 4. Serous gland (from lower turbinate) showing a secreting capillary near lower portion of field extending from lumen nearly to periphery. In upper portion of lumen are seen the orifices of several secreting capillaries. Haematoxylin and Congo red. X750 diameter.



FIG. 1

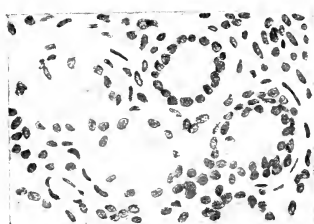


FIG. 2

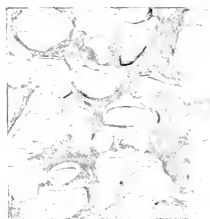


FIG. 3



FIG. 4

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I.

A CONTRIBUTION TO THE STUDY OF THE SECRET-
ING MECHANISM OF THE NOSE.

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The nasal mucous membrane has been an object of study from the beginning of microscopic research, and its secreting mechanism has received attention from physiologists and histologists. Nevertheless, an examination of the literature of this subject, at the present day, presents a confusion of opinion with regard to certain important features, a confusion which is reflected in the text books devoted to diseases of the upper respiratory passages. This has resulted in the employment of the great variety of empiric clinical procedures, of transitory vogue, which one may note in the history of laryngology.

Within a few years, our knowledge of the phenomena of secretion in mucous membranes has been considerably extended, and we are now in a better position to understand the source and nature of the fluid present on the surface of the nasal epithelium.

The object of the following paper is to review our present information concerning the subject, in connection with additional personal investigations.

Among the writers whose names are connected with the early investigations of the subject, may be mentioned Bowman, Schultze, R. Haidenhain, A. Haidenhain, Dogiel, Paulsen, Hoyer and Suchanek.

Without entering into historical details it is sufficient to say that at the present time two views are held with regard to the nature of the glands of the nose. We have, on the one hand, the opinion of Stoehr and Paulsen, that these glands are of a mixed character, containing certain cells which secrete mucus, and others which secrete serous or albuminous fluid. Schiefferdecker believes, on the other hand, that these glands are genuine mucous glands, for the following reasons: In the first place, those glands which are filled with secretion, have entirely the appearance of ordinary mucous glands in other situations. In the second place, glands are found which are almost completely filled with cells containing mucus. He is unable to find any point of distinction between those glands with mucous cells and those without, and he is therefore forced to assume that all cells of the glands are capable of producing mucus. Since his paper was published, the beginning of the channels of the secretion has been studied by new methods, which have thrown much light upon the nature of glandular structures. Up to this time, it had only been demonstrated that acini with protoplasmic cells, occurred in association with those containing mucous cells. It was not yet certain whether a combination of glands occurred, containing mucous and serous cells, or whether the appearance denoted pure mucous glands, with glandular cells in different stages of function. Experience has shown, however, with regard to the glands of the mouth, that it is extremely difficult to distinguish a mucous cell, empty of its secretion from a serous gland cell. On the other hand the newer methods of Golgi have given very valuable results, since with their help a characteristic difference has been discovered between genuine mucous glands and serous glands. The latter possess secreting capillaries, the first do not.

Retzius and E. Mueller have shown that secreting capillaries are a certain proof for the presence of serous glands.

In such glands, one sees in addition to the central lumen also delicate intercellular passages. These passages do not reach the *membrana propria*. In specimens stained by Haidenhain's hematoxilin and iron, one sees the secreting capillaries as colorless tubules, extending from the lumen between the gland cells. The secreting capillaries appear without walls of their

own, but simply bounded by the upper surface of the cell bottles as tubules imbedded in the cementing substance. Vacuoles are also found, but it is probable that they represent only transitory pictures in the cells which appear when the secretion is present within the cell, but disappear when this is not the case.

In the mucous glands, certain observers have also claimed to find secreting capillaries. If, however, one examines specimens stained by Golgi, and by other methods, he soon becomes convinced that the so-called secreting capillaries of the mucous glands are merely the walls of the mucous cells, seen in profile and direct face view. These are blackish or brown in Golgi's pictures; markedly refractile and dark with specimens stained by hematoxilin and congó red, and very sharply defined. The stained pictures show these boundaries more distinctly in proportion to the amount of mucus in the cells. In cells which have become protoplasmic, the sharp contours disappear. In those which become partially protoplasmic, the sharp contours extend only as far as the mucous zones. This appears to contradict the assumption that we have to do with secreting capillaries in the mucous glands. If this were really the case, the cell boundaries of empty protoplasmic alveoli would be more distinct than in those filled with mucus.

In addition to this point, we notice that whereas the secreting capillaries of the serous alveoli show marked irregularities with regard to their length, their form, and particularly their breadth, the septa of the mucous cells show in all places where they are distinct precisely the same appearance.

The mucous membrane of the larynx has been studied by Sophie Fuchs-Wolfring. She found in all the animals investigated, certain things in common. Everywhere the glands of the larynx and the trachea show two distinct types of acini. One type consists of tall cells with a flattened nucleus resting on its base, staining more or less intensely with mucicarmine or Delafield's hematoxilin. The boundaries of these cells are very distinct, and the lumina of the acini more or less widened, filled here and there with mucus. These are the characteristic mucous glands. In addition to these, we find in the vicinity a large number of glands of totally different appearance.

The alveoli are smaller, the cells are darker, and without refractile surface, the margins of the cells are indistinct, the nuclei are found, with the granular chromatin, the lumina very

narrow. These glands which resemble the albuminous glands, do not stain either with hematoxilin or mucicarmine. In all the specimens of this type there were found more or less distinct secreting capillaries penetrating between the cells. These two types of acini are irregularly distributed. We see, in addition, more or less well-developed Gianuzzi's demilunes, and finally the mucous and protoplasmic cells proper in the same acini, in different degrees of predominance. With regard to the efferent ducts of these glands, we may say that near the orifice on the surface, the ducts are covered with a tall, ciliated, epithelium, which is replaced at a greater or less distance, by a flatter, cylindrical epithelium, which becomes continually flatter and finally cubical.

It was not possible to determine positively whether serous glands occurred independently with their own channels of exit, or whether these always open into the efferent ducts of the mucous glands, and therefore represent lobules or mixed glands.

The glands of the larynx and trachea are thus mixed glands, as demonstrated by the presence of secreting capillaries in the serous acini, and their absence in the muciferous.

In all animals studied, it was possible to follow in these glands, the different stages of function of the muciferous cells in one and the same acinus. All stages are encountered, ranging from the pure muciferous to the pure protoplasmic.

The serous acini discharge their secretion for the greater part, into the mucous ducts. The specimens from the rabbit allow us to suspect, however, that in this animal, serous glands have their own channels of exit.

In all the specimens studied, there were found in addition to independent serous, glandular alveoli, also Gianuzzi demilunes, with serous cells, in which likewise secreting capillaries were demonstrated.

In specimens of pilocarpinised animals all the glands present a picture of marked exhaustion. The glandular cells appear flattened and protoplasmic, the lumina wide. The mucous ducts in the cat, and the secreting capillaries in the rabbit are enormously dilated. The connective tissue is penetrated by numerous lymph corpuscles.

From this presentation of the literature it will be seen that although both forms of glands have been demonstrated in the larynx of man, confusion still exists with regard to the nature of the glands of the nasal mucous membrane of man, and

we are still in the dark as to whether they are to be regarded as pure mucous glands, following Schiefferdecker, or as mixed glands, as stated by Stoeck. Before considering this question further, another important point is to be considered.

In addition to the glands of the nasal mucous membrane, another arrangement is provided for the formation of nasal fluid. This is found in the canaliculi which penetrate the basement membrane. These canaliculi were first seen by Heiberg, who found them also in the larynx and trachea. Later they were found by Chatterlier in hypertrophic, nasal mucous membrane, but were not seen with certainty in normal tissues. Schiefferdecker has found them also in normal mucous membrane. According to this writer they are readily recognizable under moderate enlargement, although smaller than the capillaries, and require no especial preparation, although they are naturally more distinct when the basement membrane is completely stained. The basement membrane is found only in the region of the ciliated epithelium or the olfactory epithelium. The canaliculi penetrate the basement membrane, and end free under the epithelium. Usually they run obliquely, and at times present a continuation between the lower epithelial cells, to a higher place which narrows above to a point. The epithelial cells pass smoothly over the peripheral opening, and send nowhere a prolongation into it. Where the canaliculi lie close to each other, they are found separated by at least two to four epithelial cells. They are, however, distributed irregularly without especial reference to their structures. In the canaliculi themselves, and also immediately above and below their openings, one finds frequently leucocytes which have wandered from the adenoid layer below, and have migrated into the epithelium. The prolongations of the connective tissue cells, which lie under the basement membrane, often penetrate into the canals, at times as far as the epithelium, and the darkly stained processes of the cells are readily recognizable in the canals. These canals are more readily recognized in hypertrophic nasal mucous membrane, and are here wider and are connected by transverse canals, so as to present, at times, a branching network. It is also easy to see here the relationship of these canals to the underlying connective tissue. In the latter, the adenoid layer is markedly developed, and one sees numerous thin strands of connective tissue, rising obliquely towards the surface. These strands are separated by light spaces, which contain numerous leucocytes, and pass directly

into the canaliculi. The rows of leucocytes extend likewise directly into these latter.

The above-described light spaces in the adenoid layer are to be considered as markedly dilated channels, but whether in direct communication with the lymph spaces, is uncertain. According to our previous knowledge, it is not probable. The fluid contained in these channels may therefore have a different character from lymph. Probably we have here to do with a fluid containing little albumin, inasmuch as after hardening in Zenker's solution or in alcohol, one does not find evidence of coagulation in the spaces.

With regard to the significance of these basement canals, it is in the first place unquestionable that they permit the passage of leucocytes through the epithelium to the surface.

Schiefferdecker believes that there is a continual passage outwardly of the fluid contained, and that the chief significance of this stream of fluid is to keep the surface of the ciliated epithelium moist. The fluid, therefore, on the surface of the mucous membrane, according to this view, must be composed of a mixture of glandular secretion, the secretion of the goblet cells and the fluid coming out through the basement canals. Schiefferdecker at the time of these observations, however, was unable to find serous glands in the nose, and regarded all the glands as purely muciferous.

After reviewing the preceding literature, I determined to examine the uncut specimens in my collection, and such others, as were, from time to time, accessible to me, with the technique suggested by Retzius, Mueller, and Wolfring, for the study of the laryngeal and tracheal glands.

The following questions were proposed for investigation.

1. What is the nature of the glands in the nose?
2. Is the aqueous vapor which nose imparts to the inspired air, derived from the glands, or from the epithelial surface, between the orifices of the gland ducts?
3. What histologic alterations in the secreting mechanism are found in cases characterized clinically by changes in secretion?

I have therefore reviewed over seventy specimens of nasal tissues, which showed clinically slight or moderate deviations from the normal. It was considered desirable to leave out of consideration for the present cases which showed marked departures from the normal, such as tumors and chronic infections. The technique employed in the examination consisted

in staining paraffine sections in the following stains; haematoxin and congo red, as suggested by Retzius and E. Mueller, Mallory's triple connective tissue stain, which affords beautiful pictures of mucous degeneration of the cells, in addition to the fibrous elements; mucicarmine as suggested by A. Mayer; muchaematin as suggested by A. Haidenhain. Many other stains were tested, but were found less satisfactory for the present purpose, such as Hoyer's thionin stain and several stains shown by Unna for the demonstration of mucin.

The cases studied may be best classified on the basis of their clinical appearances. The following conditions are comprised:

- (1). Normal tissues removed in operations upon the septum.
- (2). Chronic rhinitis showing intermittent congestion, and usually an excess of mucous discharge.
- (3). Chronic rhinitis with tendency to hypertrophy, either simple papillary or edematous.
- (4). Chronic rhinitis with tendency to atrophy.
- (5). Vaso-motor rhinitis.

1. *Normal mucous membrane.*

Six cases were examined showing mucous membrane and underlying tissue removed from the septum, in different portions of the region of the quadrangular cartilage. The specimens showed columnar, ciliated epithelium, with a well-defined basement membrane, perforated everywhere by canaliculi, running more or less obliquely. Many of these canaliculi contain polynuclear, neutrophilic leucocytes, fixed in irregular positions, indicating ameboid movement. The basement membrane passes directly into a loose, connective tissue the sub-mucosa of which exhibits irregularly outlined lymph spaces, containing small round cells, in varying numbers. These round cells have the character of lymphoid cells, plasma cells, mastzellen, with a smaller number of polynuclear leucocytes. The glands are situated usually below this lymphoid layer, and consist of aggregations of cells, the majority of which show mucous degeneration. In immediate association with these muciferous cells are others of a protoplasmic character. Close inspection of these protoplasmic or albuminous cells, shows that a certain proportion are disposed to form acini, with narrow, linear, intercellular channels. In the examination of a given field, one finds these glands with capil-

laries, situated as a rule to one side of or below the muciferous cells. These capillaries at times show an irregular course, sometimes with vacuoles near their orifice. From what we know of the serous glands in the larynx and trachea, as previously described, we may conclude that we have here to do with essentially similar glands. We may therefore say the glands in this portion of the nose are composed of chiefly mucous acini, showing various degrees of activity, as indicated by the degree of the development of the mucous degeneration in the gland cells, together with a smaller number of serous acini, which apparently form a separate division of the gland group. In the vicinity of these glands is a moderate, round-celled infiltration, consisting of lymphoid and plasma cells.

2. Chronic rhinitis, characterized by intermittent congestion, and usually an excess of mucous discharge.

Ten cases were examined where portions of the soft tissues, covering the lower or middle turbinate were removed. The mucous membrane shows in general, epithelium of the columnar, ciliated type, which at times becomes cubical and occasionally squamous. There is a well-developed basement membrane, perforated by canaliculi, containing leucocytes, as already described in the case of the normal mucous membrane. Below this region the most conspicuous changes are seen to consist in an increased development of the venous sinuses, and usually of the glands. The changes in the glands consist chiefly in an increased size and number of the mucous glands. It was not possible to demonstrate an actual increase in the size or number of the serous glands, and if this existed, it was at least, not conspicuous. The mucous glands showed, as a rule, an increased activity in the mucous changes in the cells, so that in an examination of a given field, the cells with mucous changes outnumbered those of protoplasmic character. There was also a varying increase in the amount of infiltration about the glands.

3. Chronic rhinitis with tendency to hypertrophy.

Five cases were examined of simple hypertrophy. By this term is denoted conditions showing clinically an increased size of the middle or lower turbinate, with a smooth mucous membrane, moderately firm on pressure, of an opaque, reddish

color, occurring, as a rule, in adults. In these specimens the mucous membrane shows a somewhat thicker epithelium, with more tendency to disappearance of the cilia, with more frequently cubical cells though seldom of the squamous type. The basement membrane is well defined, and shows numerous canaliculi. Below this region the chief changes are seen to consist in an increased development of the fibrous tissue, and as a rule, of the glandular elements. The venous sinuses are not dilated in proportion. About one-third of the glands consist of the serous type, the remainder of the mucous form, with active and resting cells, in varying proportions.

In the papillary form of hypertrophy the essential changes consist in an irregular mammillation of the epithelium, due to an increased proliferation of the epithelial cells. The basement membrane is well-defined, and shows numerous canaliculi. There is no especial difference noted in the glands from those occurring in simple hypertrophy.

Under the heading of edematous hypertrophy are comprised various degrees of so-called polypoid degeneration, and actual polyp formation. The mucous membrane is usually somewhat thinned, and consists of cells ranging in type from columnar ciliated to squamous, the latter occurring, as a rule, in situations exposed to constant irritation, as the anterior aspect of polypi. The basement membrane is usually a slender, well-defined line, showing canaliculi in considerable numbers. Below this region, there is an evident fibrous hypertrophy, accompanied by edema. The individual connective tissue fibres, appear as delicate, interlacing strands, separated by intervals of varying size, dependent upon the degree of the development of the edema. In this edematous area, glands are seldom encountered. Where they occur, they are usually found in the deeper portions. In these situations they show little or no tendency to increase in size or number. The mucous cells of the mucous glands are usually less frequent than in cases of hypertrophy without edema. The serous cells show no marked alterations in character.

4. *Chronic rhinitis with tendency to atrophy.*

Two cases of genuine, atrophic rhinitis with ozena were examined, which showed characteristic changes in the mucous membrane. This appeared as a thick, compact layer of squamous epithelium, passing immediately to the rete mucosa, with-

out intervening basement membrane. There was little or no evidence of migration of leucocytes through the epithelium. Below the rete mucosa, one comes upon glands, somewhat diminished in numbers and size, about one-third of which have the character of serous glands. The remainder are evidently mucous glands, which show considerable activity, as evidenced by their mucous changes.

In addition to these instances of atrophic rhinitis, several cases were examined of dry, anterior rhinitis. This term is used by Ribary to denote those cases of metaplasia of the mucous membrane of the septum, in the anterior part of the quadrangular cartilage, usually associated with a certain degree of convexity of the septum. The mucous membrane shows here epithelium of the squamous type, passing directly into the fibres of the rete mucosa, without intervening basement membrane. There is little or no evidence of the diapedesis in these regions. The mucous glands below are either absent or diminished in numbers. Where present, they are small, and consist chiefly of mucous elements.

5. *Vaso-motor rhinitis.*

Under this heading are comprised those cases, characterized by a profuse, intermittent discharge of watery secretion from the nose, either seasonal or perennial, attended by symptoms of nervous irritation. These cases show certain striking histologic characteristics in common. The mucous membrane, if not previously subjected to destructive treatment, is of the columnar, ciliated type, underlaid by a well-defined basement membrane, with exceedingly numerous and markedly dilated canaliculi. These canaliculi, as a rule, are crowded with polynuclear leucocytes. In the rete mucosa and sub-mucous connective tissue, there is an unusually marked infiltration of round cells of varying kinds. The sinuses, as a rule, are numerous and well-developed. The glands show about one-third their number to consist of the serous type, the remainder being of the mucous form, either active or resting. There was no characteristic relation observed between the type of symptoms and the nature of the glands. Cases of marked clinical severity, presented the greater increase in the number of and size of the canaliculi, which at times causes the basement membrane, to assume the character of a loose mesh. In these instances, the epithelial cells, immediately above, showed numerous in-

terspaces, filled with leucocytes, while a rapid exfoliation of epithelial cells was apparently taking place.

In reviewing the appearance found in the preceding conditions, we may summarize the histologic alterations as follows:

Simple chronic rhinitis is characterized chiefly by an increased development of the venous sinuses and of the glands. Hypertrophic rhinitis exhibits an increased proliferation of the epithelial or of the connective tissues or of the glands, although these latter, as a rule, play a subordinate part, while no characteristic alterations in the canaliculi are observed. In atrophic conditions, the most important alteration in the present connection consists in the epithelial metaplasia, by which the pervious, columnar, ciliated epithelium and basement membrane is transformed into a dense, compact, squamous epithelium, lying directly upon a compact, rete mucosa. The glands are diminished in number and size, but in a moderate degree, the mucous acini being distinctly alive. In vaso-motor rhinitis, the characteristic alterations consist in a marked increase in the number and size of the canaliculi of the basement membrane, and in the perviousness of the overlying epithelium. With this is associated a marked, round-celled infiltration. The glands show a moderate increase in number and size, but there is apparently no increase in the amount of mucous degeneration, and it was not possible to demonstrate an increased activity in the serous glands.

Before entering upon a consideration of the preceding phenomena, it will be desirable to call to mind the following physiologic facts.

First with regard to the function of the nose, in supplying moisture to the inspired air, we know that a very large amount of aqueous vapor is being constantly exhaled; under normal condition, approximately 500 gr. in twenty-four hours. The greater portion of this comes from the nasal mucous membrane.

It is found that inspired air, after leaving the nose, on its way to the lower air passages, is practically saturated, so far as its own temperature is concerned, irrespective of external atmospheric conditions, whether these be cold and dry or warm and moist. Although the nose is capable thus of nearly saturating the inspired air, it must not be forgotten that the air, after passing the nose, attains a higher temperature in its course lower down in the lungs. We find that expired air is under all circumstances, practically saturated with mois-

ture. It is thus evident that the passages below the nose, contribute this difference in moisture.

It may be said that the nose furnishes about two-thirds of the total amount of water evaporated from the respiratory mucous membranes, approximately 350 gr. in twenty-four hours.

While under ordinary conditions the moisture present on the surface of the nasal mucous membrane is derived from the secreting mechanism of the nose itself, nevertheless, it must not be forgotten that at times, a portion of the nasal fluid comes from the condensation of *expired* aqueous vapor.

The amount of moisture which air is capable of holding depends upon the temperature of the air itself, increasing in direct proportion to increase in temperature. If air, at a given temperature, containing 100% relative humidity is cooled, a definite amount of vapor becomes condensed, and falls as water. This phenomenon may be observed in the nose under certain conditions. During cold weather, the temperature of the nasal mucous membrane is markedly less than that of the air passages lower down. Thus, air passing up from the lungs, saturated with moisture strikes the cooler surface of the nose, and experiences a lowering in temperature, with the result that a certain amount of moisture is deposited upon the mucous membrane. With the next inspiration, a definite amount of this moisture is vaporized, and passes into the lower air passages and is again expired. If the difference in the temperature of the nasal mucous membrane and that of the lower air passages is slight, this moisture in the nose is not perceptible but if the difference be marked, the excess of expiratory condensation over inspiratory vaporization, results in the accumulation of water in the nose in perceptible amount. This is the explanation of the occurrence of watery running from the nose, so common in the winter, in many persons, and as may readily be seen, is more marked in those of poor peripheral circulation than in robust individuals with a good peripheral circulation.

With regard now to the source of these 350 gr. of aqueous vapor, given off by the nasal mucous membrane, it seems probable that the largest portion comes by transudation, through the canaliculi of the basement membrane and interspaces in the columnar epithelium. Evidently the mucous glands can produce little or nothing of consequence, and it would be difficult to understand how the comparatively small number of serous glands could furnish the amount required. Several

years ago in carrying out some investigations on the respiratory functions of the nose, numerous experiments were undertaken by me with regard to the amount of water evaporated from the nasal mucous membrane, under different conditions of external temperature and humidity. It was found that the nose was nearly capable of saturating the inspired air, irrespective of external, atmospheric conditions, whether these were dry or humid. Rapid alterations in atmospheric conditions were tested with the same result. For this reason it is improbable that the glands of the nose played other than a subordinate part in supplying the evaporated vapor. If, on the other hand, we attribute the source of this vapor to transudation through the canaliculi and epithelium, we have the problem at once removed from a physiologic fluctuation in glandular activity to merely an increased or lessened osmosis through the mucous membrane.

We may therefore say that the fluid present on the surface of the nasal mucous membrane is composed of the secretion of the mucous and serous glands, together with a definite proportion of fluid transuded through intercellular spaces of the mucous membrane. With this is mingled a varying amount of mucus, derived from degeneration of the epithelial cells, together with migratory leucocytes, and cellular detritus. Finally under certain conditions of external cold, there is added by condensation a varying amount of water exhaled from the lower respiratory passages.

Under pathologic conditions the glands and canaliculi become altered. In chronic rhinitis, characterized by intermittent congestion and increased mucous secretion, there is found a heightened proliferation and mucous degeneration of the cells of the mucous glands.

In chronic hypertrophic rhinitis, and its various forms, papillary hypertrophy and edematous hypertrophy, there is no proportionate increase in the activity of the glands or in the number of the canaliculi. In atrophic rhinitis the glands are somewhat diminished in number and size, but the most striking alteration is the entire absence of canaliculi in the basement membrane. The transudation of fluid is thus suspended and we encounter therefore a fluid, consisting of mucous and albuminous secretions of the glands, together with a variety of cells and bacteria and their products.

In vasomotor rhinitis, we find an increase in the number and size of the canaliculi in proportion to the severity of the

symptoms. The serous glands show possibly a heightened secretion, but the mucous glands show no evident increase in activity.

As a result of these findings, several therapeutic considerations suggest themselves. In conditions characterized by increased mucous secretion, it is evidently useless to destroy a portion of the epithelium by caustics, unless better drainage or freer respiration are hereby induced. In atrophic rhinitis, the patient does not suffer from lack of mucus, and it is difficult to understand how tablets of mucin could be of service. The ozenic individual is greatly in need of more water in his nasal secretion and on theoretical grounds it would be desirable to introduce substances favoring exosmosis, especially of hygroscopic properties.

Finally we have on theoretical grounds another means of altering the amount of fluid evaporated from the nasal mucous membrane. This consists in increasing or diminishing the respiratory changes in intranasal air pressure. If, for instance, we place a partial obstruction in the anterior nares, the degree of inspiratory rarefaction is increased and transudation of fluid consequently heightened. This may explain the improvement noted in atrophic rhinitis from the injection of paraffin.

On the other hand, removal of anterior obstructions is indicated in cases characterized by increased watery secretion, as in vasomotor rhinitis.

(My thanks are due Prof. Charles S. Minot for facilities kindly afforded me in the laboratory of Histology and Embryology in the Harvard Medical School.)

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SKIAGRAPHY AS AN AID IN THE DIAGNOSIS AND
TREATMENT OF DISEASES OF THE ACCESS-
ORY SINUSES OF THE NOSE.

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The employment of the X-rays as an aid in the diagnosis of diseases of the accessory sinuses has hitherto been of little value. The credit of the process about to be described is probably due to Prof. Dr. Killian of Freiburg, a knowledge of whose work was brought to my attention last October by Dr. F. C. Ard, on his return from a visit abroad. Dr. Ard brought with him a plate showing normal frontal sinuses and one in which suppuration in one of the frontals could be readily diagnosed.

The only information that we had to guide us in the method of taking these photographs were the statements of Dr. Ard that the patient lay prone on his face, a photographic plate being placed under the forehead and the tube with a compression apparatus placed over the occiput. The time of exposure was stated to be 3-4-5 minutes. Dr. Ard was unable to bring very definite information as to the value placed upon skiagraphy by Prof. Killian.

With this meagre information, I brought the matter to the attention of Mr. E. W. Caldwell, who is the Director of the Gibbs' Memorial X-ray Laboratory at the University and Bellevue Hospital Medical College.

Having no personal experience, whatever, with the use of X-ray my part of the work has been to furnish patients, both dispensary and private, and to interpret the plates made by Mr. Caldwell.

The first photographs obtained gave a fair outline of the cavities but were not so good as those latterly taken.

Mr. Caldwell is at present at work upon an apparatus whereby he hopes to simplify considerably the taking of these pho-

tographs, and should his expectations be realized, he will publish his method.

Up to the present time, we have taken 44 skiagraphs, one of which was of normal frontals for purposes of control.

Since November 1st, 1904, I have performed a radical operation on ten patients whose skiagraphs have been taken. The operation consisted in a complete removal of the anterior wall of the frontal sinus. We were thus able to compare the height and width of each sinus, together with the number, size and position of the septa that these structures show in the skiagraph. While this number of verifications is not sufficient to enable one to interpret all the peculiarities observed in the plates, it suffices for the following conclusions:

First—It is possible by means of a skiagraph to determine the presence or absence of a frontal sinus which extends vertically above the glabella.

As in simple photography a single sitting may not give a satisfactory negative. This may be due to a faulty manipulation of the apparatus, imperfect development of the plate or to the subject having a large and thick walled skull. We have a very fair skiagraph of medium sized frontals in a colored woman with a large head.

A frequent source of error results from the rays passing through the head in an improper direction. For example, if the rays enter at a point too far above the occiput a small sinus may not be visible; with the rays entering too low down on the neck, some of the ethmoidal cells or the sphenoidal sinuses may be projected upwards so as to appear in the plate in the situation of the frontal sinuses.

The inspection of the plate with reference to the upper outline of the orbital cavity usually shows whether the rays have passed through the skull at nearly right angles to the forehead. There is greater difficulty in getting a satisfactory plate in patients whose forehead is sloping than in those where it is vertical.

One can readily understand the importance to the surgeon of knowing that there is a frontal sinus before he begins his operation. A. Logan Turner from an examination of 240 European crania found "18 skulls or $7\frac{1}{2}\%$ had no sinuses, while 23 or $9\frac{1}{2}\%$ had only one sinus." On two separate occasions I have operated needlessly on women, on the right side, for frontal sinus when no trace of one could be found; in each case there was a left frontal sinus. A skia-

graph of their heads would have shown the abnormal development.

Second—A frontal sinus may be small, parallel with the upper, inner margin of the orbit and not detected in the skiagraph.

We made five plates of a man where this condition existed. The skiagraph showed no trace of a cavity in the vertical portion of the frontal bone. There were numerous small polypi in both middle meati. A frontal sinus probe was passed upwards through the naso-frontal duct slightly outwards to a distance of eight centimeters from the lower portion of the vestibule of the nose. From a clinical standpoint there could be no doubt that the tip of this probe was situated in a cell 1.5 centimeters above the inner canthus of the eye. The left frontal region was explored under ether, and no trace of any frontal sinus could be found in the vertical portion of the frontal bone. After passing through the outer table, a vascular, spongy diploe was encountered. On operating, at a depth of 1.2 centimeters, the hard posterior table was met. The diploe was scooped out below and behind the attachment of the nasal bone, when a small, narrow, slit-like cavity, about 1.5 centimeters long and 0.3 centimeters wide was entered. It was lined with a thick, polypoid mucous membrane and contained a small quantity of pus. A probe readily passed through this cavity into the nose. This was the only trace of a cell found in this region. Had the exploratory incision been made through the orbital, instead of the vertical plate of the frontal, this cavity would have been quickly entered.

Third—In all cases of unilateral disease of the frontal sinus verified by operation, we have observed a cloudiness in part or all of the area occupied by the sinus and an indistinctness in the outline of the cavity when compared with the opposite or healthy side.

The appearance is not unlike that of "fogging" in a plate. Whether this cloudiness is due to the presence of pus in the cavity, as I suspect, or to the changes in the surrounding bony walls as a result of the disease, I have not yet been able to determine. It is possible that with an experience, resulting from examining many skiagraphs, the presence of this cloudy area, provided "fogging" may be ruled out, may be an aid to diagnosing frontal sinus suppuration. The same cloudiness has been observed in bilateral disease of the mouth.

Fourth—The skiagraph has invariably shown the frontal sinus to be somewhat larger in all dimensions than it proved to be when operated upon.

This is undoubtedly due to the divergence of the rays as they pass from the tube to the plate.

Fifth—A good negative may be depended upon to show the septum separating one sinus from another.

The various incomplete septa that may be present in each sinus are usually shown quite clearly.

Sixth—An oblong, narrow, much darker area, nearly parallel with the upper margin of the orbit on its nasal side, and usually just above it, whenever present, has been found to be an orbital prolongation of the frontal sinus, running antero-posteriorly above the orbit, oftentimes the full depth of the latter.

It is exceedingly valuable to know this prior to operating, as it usually means a more tedious operation in the complete removal of the diseased membrane.

Seventh—We believe that the examination of a skiagraph of the two frontal sinuses when compared with results found on trans-illumination will aid very much in determining the presence of a diseased frontal sinus.

For example: If the left frontal sinus as in our plate, is seen to be nearly as large as the right, but trans-illumination shows a much smaller area of luminosity and a much less brilliant color, we should be strongly inclined to make a diagnosis of suppuration in such a sinus.

Eighth—Skiagraphy may prove a valuable aid in determining our method of treating a chronic suppurative frontal sinusitis.

Given a small sinus with few or no septa: I would prefer to treat such a case by establishing good nasal drainage and believe that in doing so most of them will be cured. On the other hand, if the skiagraph shows us that we have a large sinus with many septa or an orbital offshoot, intranasal treatment is of little avail, and a radical operation should be promptly advised.

Ninth—The sphenoidal sinus.

In one case, two large dark areas near the median line, just above the glabella were for a time unexplainable. Since the nose in this patient has been cleared of polypi, I have been able to determine the presence of two enormously large sphenoidal sinuses. Although we have not yet operated upon

him, I feel sure that those dark areas are due to the projection forward of the sphenoidal sinuses, rather than to any peculiarity in the frontals themselves.

Tenth—A skiagraph may also be of considerable value in determining the height and width of the ethmoidal cell area.

In one of the cases of suppurative ethmoiditis associated with the formation of multiple polypi, the same cloudy appearance of the plate is noticed here as in pus in a frontal sinus. I believe this point to be of considerable value to us as indicating the necessity for thorough curettage and drainage of the ethmoidal cells, in order to effect a cure in such cases.

Eleventh—If the plate can be so arranged as to include the superior maxilla as well, we have noticed that a chronic suppurative process in an antrum presents the same filmy appearance as above noted in similar conditions of the frontal sinus and ethmoidal cells.

A healthy antrum presents an irregular, triangular area, dark in color, with a few light colored septa running through it, many of which are ridges present in the wall of this cavity.

III.

RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA WITH EXTENSIVE NECROSIS IN A PATIENT WITH TUBERCULAR HIP JOINT DISEASE AND INHERITED SYPHILIS FOLLOWED BY TUBERCULAR MENINGITIS—DEATH.

RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA WITH ACUTE MASTOID EXACERBATION AND WITH LATENT MENINGEAL SYMPTOMS SECURED LATER FROM MEMBERS OF THE FAMILY—OPERATION IMMEDIATELY FOLLOWED BY LEPTOMENINGITIS AND DEATH.

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NEW YORK.

Two objects have been in view in presenting the histories of the two cases which I have the pleasure of reporting in this short paper. First, to call attention to the fact that one may happen to operate just at the time when a serious intracranial complication is about to appear, and second that at this time, when so many men are doing large numbers of Schwartze-Stacke and Stacke operations, fatal cases should be reported. Although one was operated upon primarily because of the acute mastoid symptoms, yet, owing to the chronic nature of the disease and the extensive necrosis, a Stacke-Schwartze was performed. Briefly related the histories are as follows:

C. K——. Age, 15 years. Was referred to my clinic at the Manhattan Eye and Ear Hospital by Dr. Daniel Dougherty July 15, 1902. She had been under Dr. Dougherty's treat-

ment for one year during which time he had resorted to the various methods of local treatment for the relief of a chronic suppurative otitis media. One year previously he had removed a large mass of adenoids. The mass was sent to the laboratory and tubercular bacilli were found.

The patient was undersized and badly nourished. The father died at an early age from dissipation probably complicated with specific disease. Her right ear began to discharge three years ago, while she was under treatment at the Hospital for the Ruptured and Crippled for tubercular hip joint disease, and has continued ever since. There was evidence of pulmonary tuberculosis. Two years later she had an attack of keratitis which was followed by an attack of specific iritis resulting in considerable damage to vision. She had received thorough internal medication for her syphilitic condition. The membrana tympana was almost completely absent and the canal had a macerated appearance. The ossicles, while partially necrosed, were still present. She had been gradually failing in health for some time, but had a fairly good appetite and was able to come to the clinic. It was noted that the discharge was unusually profuse. This and the fact that a prolonged local treatment had failed to benefit her led me to decide upon a complete radical operation. She was admitted to the hospital on the morning of July 22nd, and after preparation a Stacke operation was performed. After reaching the antrum it was found that the mastoid cells were also involved and a complete Schwartze-Stacke operation was then made and all the diseased cells removed. A specimen of pus was sent to the laboratory which showed the presence of smegma bacilli. No tubercle bacilli could be found. The necrotic process had extended through both the attic and antrum tegmen so that the dura was exposed for considerable area. A very thorough curettment was made, during which the malleus and incus were removed, together with large quantities of granulation tissue, after which the wound presented a clean appearance. Hemorrhage was at no time excessive. A Panza flap was made. Up to this time I had had no knowledge of attempts having been made to fill in the exposed areas of bone by the use of skin flaps taken from the surface posterior to the wound. I loosened a tongue of skin and swung it into the antrum region holding it in place by the pressure of gauze packing introduced through the auditory canal. The posterior wound was then closed. A careful examination of

the exposed dura was made, but it was found intact. However, it seemed considerably congested. The posterior wound was closed by the use of silk sutures. It had been observed that her temperature upon the day of operation was 100.2 and pulse 98. This was the first time her temperature had been taken after coming under my observation. At eight o'clock in the evening it had dropped to normal, with a pulse of 100. The temperature began to rise during the night, and at 8 o'clock in the morning of the 23rd it had reached 100 degrees with a pulse of 102. The dressings had become discolored and the outside ones were removed and replaced. The line of incision of the posterior wound had an unhealthy appearance and a little pus exuded from between the stitches.

On the morning of the 24th the patient complained of considerable pain in the region of the right ear. The dressings were all removed. There was considerable pus coming from the posterior wound between the stitches. These were removed, the wound opened freely, cleaned carefully and packed from behind. The skin flap showed a tendency to slough and was cut away. Her temperature had increased to 101 degrees with a pulse of 120. There was a slight temperature drop at 8 a. m. on the 24th, after which it gradually increased, reaching 102.2 in the afternoon. Under stimulating treatment the pulse became a little stronger and less frequent. At the time of dressing on the 24th the wound was probed in every direction but there was no communication that could be found leading to the brain. On account of the free amount of pus present in the wound a further operation was advised with the intention of exploring the brain cavity. The mother of the child refused to permit any further operative interference. During the 25th the patient complained of severe headache, but there was no paralysis. It was difficult to get a satisfactory examination of the eyes owing to the results of her keratitis. At this time the odor from the discharge became somewhat marked. During the remainder of the 25th, 26th, and 27th the temperature ranged from 102 to normal. The normal temperature, however, was observed only at noon on the day of the 27th, at which time the pulse was 90. There was no vomiting, no chills and the patient was conscious and talked freely. Wet dressings were now used and changed four or five times daily, and the wound was thoroughly cleaned out each time. The swelling and edema about the wound had gradually subsided. On the 28th the tempera-

ture began to rise and by 8 o'clock in the evening had reached 104 degrees, the pulse, however, did not materially increase in rapidity, but was somewhat weak. On the 29th there was a reduction of temperature ranging at about 102 degrees with a pulse of 80 to 100. There was less discharge, but the wound seemed to be sloughing and had an unhealthy appearance. The patient complained of a good deal of pain, and there was marked loss of appetite.

Dr. Wm. M. Leszynsky, the consulting neurologist of the hospital, was called in and gave it as his opinion that she was suffering from tubercular meningitis.

On the afternoon of the 31st the temperature again reached 104 degrees, which gradually subsided, and on the morning of August 1st it became normal once more with a pulse of 80. She became somewhat stupid, complaining of severe pain in the head and excessive discharge. She gradually became weaker and finally became entirely unconscious, and during the afternoon of August 2nd her temperature rapidly arose until the time of her death, 9:30 p. m., it had reached 106.6. All efforts to secure a postmortem in this case were futile.

CONCLUSIONS.

1. This was a clinic case and the temperature had not been taken until the morning of operation, when she came into the ward. In the light of the subsequent history she probably had temperature variations for some time. There was, however, no other marked symptoms of intra-cranial disease.

2. Beyond the possible influence of the shock of the operation it would seem that the course of the disease would have been about the same with or without operation.

A. M.— Age, 21. Came to my clinic at the Manhattan Eye and Ear Hospital March 23, 1904. Had diphtheria at three years of age, which was followed by suppuration of both ears. The suppuration became chronic and had continued for eighteen years. There was odor from the discharge on both sides. The hearing was practically gone in both ears and she complained of some tinnitus. There had been pain in ears at intervals, and there was at this time very slight tenderness over both mastoids, more marked on the right side. There was no record of a subsequent call for treatment until March 28th. Upon that date she consulted Dr. Neres, to whom she

had been assigned for treatment, at his office, and complained of severe pain in the right mastoid region. She had been unable to sleep during the previous night, and had the appearance of one who was suffering severely. It was noted that she had facial paralysis of the right side, which she stated had come on suddenly two days previously. She was admitted to the ward on the afternoon of that date. The ward history states that she had had pain in the right ear on and off since four years of age, the attacks having been of a neuralgic nature. A few days previously she had a severe cold which had resulted in a good deal of increase in the discharge. There was free discharge from the canal and entire absence of both drum and ossicles. There was slight tenderness on deep pressure over the right antrum, the facial paralysis being marked. A smear from the right ear showed mixed infection.

March the 29th at 3:30 p. m. a Stacke-Schwartz operation on the right ear was performed by Dr. F. E. Neres. The attic and antrum were filled with a tumor-like mass which was quite firm. The middle ear also was entirely filled with granulation masses. Neither the dura nor lateral sinus was exposed at any point. All was thoroughly cleaned out and a Körner flap made. The posterior wound was closed with silk sutures. The temperature at the time of operation was 99 and the pulse 110. She had slept fairly well the night before, but complained of pain in the right mastoid region. Previous to operation her ear had been douched freely with bichlorid solution 1-5000, and she had been given two grains of calomel followed by a saline. She slept fairly well during the early part of the following night. Toward morning she vomited freely a greenish liquid and complained of severe pain in the lumbar region. Her temperature, however, did not go above 99 degrees, pulse 110 respirations 24. The pulse was weak. The facial paralysis remained the same as before operation.

At 4 p. m. on the 31st the temperature began to rise and by eight o'clock it had reached 104 degrees. The pulse was intermittent 110.

On the 30th a specimen of urine sent to the laboratory showed a specific gravity of 1030 with no albumen, but slight trace of sugar.

On the 31st catheterized at 8:15. A specimen sent to the laboratory showed a specific gravity of 1024, with a large amount of albumen and some sugar. The microscope revealed granular, hyaline and epithelial casts. The dressings were re-

moved at 10 a. m. and the ear was repacked with iodoform gauze and there was no sign of pus or extension of infection. The temperature arose gradually until it reached 105 degrees and the pulse became weaker. The patient became unconscious. Further operation was refused by the family. She was given strychnin and morphin at intervals, and once or twice doses of nitroglycerine. She died at 1:30 p. m., April 1st. A postmortem could not be obtained.

During a conversation with the mother during the last day of the patient's life, it was learned that about two weeks previous to the date when she came to the hospital she had had a severe attack of vomiting of a projectile character with violent headache and partial loss of consciousness, which had lasted for two or three hours. The family physician had told them that it was a bilious attack, so that they had not in any way connected the occurrence with her middle ear disease. The complete Stacke-Schwartz operation was performed on account of the very chronic nature of the disease.

CONCLUSIONS.

1. The acute exacerbation of mastoiditis in this case was sufficient cause for operation.
2. The chronic character of the suppuration justified the radical operation.
3. The paralysis, while considered due to either local pressure or extension of necrosis should have led to more serious consideration of possible meningeal symptoms, which were not discovered until after operation.
4. It is not probable that beyond the effects of shock the operation had any influence upon the course of the meningitis. It is to be regretted that no postmortem could be obtained.

IV.

SOME FURTHER REMARKS ON THE CASE OF CHOLESTEATOMA PRESENTED AT THIS SECTION A YEAR AGO.*

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It may be recalled that in the discussion following the reading of the paper referred to, "Cholesteatoma with report of a Case," || at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society at Fall River one year ago, the question of dealing with a large cavity left after the removal of the tumor came up, and some suggestions were offered as to the proper method of disposing of it. It may be remembered that after removing the mass of cholesteatoma there remained a cavity measuring eight centimeters antero-posteriorly, seven centimeters vertically, and two to four centimeters deep, exposing a large surface of dura which positively refused to granulate and fill up by any process resorted to, and they were not few. Fig. 1 shows the opening into the cavity which existed at that time. It had been learned by experience that by frequent irrigation the parts might be kept clean, but if left to themselves even for two or three days, the lining membrane, which looked not unlike a dry mucous surface, began at once to be covered with a material resembling that removed at the operation, and at once underwent decomposition.

In the discussion of the paper it was suggested, among other methods, that the inner surface of this cavity might be covered with Thiersch grafts, and a radical operation performed, and the outer opening closed. Accordingly, an attempt was made to get some grafts to take hold of the outer surface of the dura. This membrane was scraped till a raw, clean surface was produced and a fair sized Thiersch graft applied in the usual manner, but it did not adhere. Feeling that perhaps something in the technique was at fault, the procedure was re-

*Read before the Eastern Section of the American Laryngological Rhinological and Otological Society, at Philadelphia, February 4th, 1905.

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peated some three or four times; each attempt was made more careful and painstaking than before, but the result was the same.

At this time, at the suggestion of Dr. Dench, who kindly examined the case, an attempt was made to obliterate the cavity by removing all the bony covering of the cavity, and at the same time to do a radical operation, uniting the cavity with that of the middle ear. This was accordingly done, which



Fig. 1.

resulted in removal of the cranial bones over an area of about forty-five square centimeters. The edges of the old opening were freshened, the scalp was dissected well from the pericranium upward for about three centimeters, for the purpose of preventing too much tension on the sutures, and the parts brought together with interrupted sutures, with the intention of irrigating and keeping the cavity clean while union was taking place, and at the same time firm pressure was made on the soft tissues behind the ear, in order to secure, if possible, adhesion of the soft tissues to the dura. A few weeks of this

treatment demonstrated two things: First, that the cicatrix formed by bringing the superficial parts together was becoming very thin, and was soon followed by an opening into the cavity behind the ear. This condition continued until the opening reached the size of twenty to twenty-five millimeters in diameter; and inspection now showed further that there had been no attempt at union between the dura and the tissues covering it, but on the other hand, the same kind of membrane covering the dura was also lining the proximal surface of the outer tis-



Fig. 2.

sues. As the superficial tissue since the second operation had been kept pressed in upon the dura, or as nearly as is possible in approximation to it, the cleft remaining was very narrow, though nearly as extensive otherwise as before. This inner surface remained clean as long as it received frequent irrigation, but if left more than three or four days would be covered with a membrane brownish in color, with a great disposition to decompose. It was now felt that union between the outer surface of the dura and the overlying soft tissues was ex-

ceedingly improbable, and it was thought best, therefore, to close the opening and to instruct the patient to keep the cavity clean by occasional douching for whatever length of time the case might demand. Accordingly the whole side of the head was shaved, the edges of the opening were freshened, and a piece of the scalp was dissected from the parietal region extending about seven centimeters above the opening and brought down and sutured below and in front, while it was left free above, that there might be no traction on the cicatrix. The sliding down of the whole scalp from above left a triangular space of uncovered pericranium about four centimeters wide at the base, by eight centimeters long. This was filled in with Wolf grafts taken from the thigh. No disturbance followed the operation. The patient was up in four or five days and left the hospital in about a week. The wound united everywhere by primary union, and although a part of the graft sloughed, the ultimate result was very satisfactory, and the patient able to return to work in about four weeks. The appearance at this time is represented by Fig. 2.

During the second operation in removing the rather large area of cranium, in order to uncover all of the dura affected by the cholesteatoma, it was found necessary to extend the operation forward practically to the auditory canal, removing the whole of the mastoid tip. At this time the face was watched carefully to note any signs of injury to the facial nerve, but none was observed; nevertheless, after coming out from the ether, as was expected, he had complete paralysis of that side of his face. Taking into account the amount of bone removed, it was believed that not only must the facial nerve been injured, but that in all probability a considerable portion of it removed.

Since the recovery from the last operation the patient has presented himself from time to time for observation; the paralysis has now largely disappeared, although not entirely—he says he can do everything but “whistle and spit.” The douching still brings away small shreds of cholesteatomatous lining of the cavity, though it is becoming less and less, and it now seems possible, at least, that the mucous lining of the tympanum may extend backwards and by degrees displace the unhealthy lining of the cholesteatomatous cavity, which, if it should occur, will place this surface in an ideal condition. His hearing on this side is now for watch 12/10, and loud whisper 10 feet.

DISCUSSION BY E. B. DENCH: I saw that case. The results which Dr. Dudley has obtained are most admirable. I have never seen a plastic operation which was more satisfactory. It is surprising what results you can get with a great loss of tissue. I have been astonished what good results could be obtained in secondary operations by means of the sliding flaps. We are sometimes deterred from this by the fear that the cicatricial tissue will slough. I have found that these cases close up admirably.

V.

REPORT OF A CASE OF MYCOSIS OF THE THROAT TREATED BY THE X-RAY.

BY LEE MAIDMENT HURD, M. D.,

ASSISTANT SURGEON MANHATTAN EYE AND EAR HOSPITAL.

The prime etiologic factor in so-called pharyngo-mycosis is yet to be found. The old theory, that the *leptothrix buccalis* is the cause, has been doubted by Siebenmann, Brown, Kelly, Goodale, Kyle, Richardson and others. I think it has been fairly conclusively proved that the condition is a keratosis, and that this keratosis seems to be caused by some local irritation; whether that irritation is the *leptothrix* or something else we cannot say. Pharyngomycosis is not as rare a disease as the text books would lead one to believe. I averaged about six cases a year out of about 1,200 clinical cases, but most of them come to be relieved of conditions other than those due to mycosis. And there is no reason to interfere in this condition unless it gives rise to annoying symptoms, but when the mycosis causes uncomfortable symptoms of the throat we are generally face to face with a seat of obstinate disease, which is plainly shown by the long list of remedies recommended for its relief. And of this list, the galvano-cautery seems to be the best; but when in an extensive case, like the one I am about to describe, the treatment seems a little too heroic.

Under the supposition that the X-ray would have a beneficial effect on the abnormal condition of the surface epithelium and if the keratosis was due to the *leptothrix*, the germicidal properties of the ray would make it still a more potent remedy.

I regret I have only one case to report, but it was over a year after I thought of using X-rays before I found one appropriate for the trial, and I have not seen another since in which the symptoms were severe enough to justify the time and expense for treatment with the rays. I therefore report this case, fully realizing that one case proves nothing, but in the hope that it may lead some of my colleagues to try it in a similar case,

thereby demonstrating whether or not the X-ray is of service.

J. R., age 30, male; occupation a medical student, consulted me May 25th, 1903, with the following symptoms: For the past three or four months the larynx and the pharynx felt raw and stiff, and these symptoms were increased with every spell of bad weather. Pain in the left ear with some diminution in breathing. He was hoarse and his throat felt full especially after using his voice. Repeated attacks of acute laryngitis were common. Both Eustachian tubes felt closed at times, the left one most of the time. He first noticed white tufts on his tonsils and postpharyngeal wall about three months ago. His teeth are in good condition. He does not use tobacco or alcohol. He sleeps in a dark room, and the only condition that might be an etiologic factor is a chronic gastritis, which he has had for some years, and which is better at present; but otherwise his health is good.

Examination: The tonsils are flat, fibrous and recede behind the anterior pillars. Large white tufts are numerous on the tonsils, also on the postpharyngeal wall and extend upward on the left side into the mouth of the Eustachian tube. The lingual tonsil is nearly covered with patches of larger size and a few tufts are located on the aryteno-epiglottic fold of the larynx and extend to the false cord on the left side.

Treatment: Only the X-ray was used; at first ten-minute sittings, twice a week, for six weeks. The pain and discomfort diminished after the first few exposures, and after the fourth some of the smaller tufts became soft and could easily be wiped off with a cotton pledget. The small patches began to disappear, and at the end of six weeks the patient went to the country for the summer, with instructions to lead an open-air life as much as possible.

He returned three months later, September 30th. The condition had remained stationary since he was last seen. He again went under treatment with the X-ray, ten-minute sittings, three times a week, and by the end of November nearly all the spots had disappeared. Then the time between exposures lengthened to twice a week, and by the end of December no spots could be found.

The tonsils and pharynx were directly exposed to the rays through a speculum, something like a Fergusson vaginal speculum, with a large flange to protect the face from the rays. The lingual tonsil and larynx was treated with the rays from the outside, through the tissues of the neck.

In all he received forty-one treatments, of ten minutes each, a medium tube with a spark gap of about three inches being used. Most of the applications were made through the tissues of the neck. The X-ray was administered by Dr. Frank B. Carpenter, 616 Madison avenue, New York City.

The patient had no return of the mycosis and has been free from attacks of laryngitis, up to the present time.

This disease subsides spontaneously sooner or later, and this case may have been treated just as the subsidence was about to take place, but the fact that his throat began to feel better after each exposure to the ray, leads me to believe that X-ray was the cause of his improvement.

15 East Forty-eighth Street.

VI.

TECHNIQUE OF THE RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA.*

BY JOHN D. RICHARDS, M. D.

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It is scarcely necessary more than to allude to the fact that the operation in question is one of the most beneficent in modern surgery. At the same time it is one of the most difficult, and there are few procedures which depend more for a successful issue upon careful attention to the detail of technique. It is from this source that any further advancement in the operation may be expected; it is upon this basis that the operation has reached its present high degree of efficiency.

There are a few points in the technique of the operation as here described, which I have not seen advocated and which may be of some slight advantage. The sterilization of the field of operation, instruments, etc., and the preparation of the patient, we are all familiar with, and therefore their recital is unnecessary.

If a curved line is so placed that one extremity is at a point immediately above the mastoid tip, the other at a point on the scalp corresponding to the top of the pinna, and its center passes through a point about one inch posterior to the line of auricular attachment to the head, a proper incision will have been outlined. This incision is not bounded internally by the bone excavation but is posterior to it, two advantages resulting, namely, that should granulations sprout in the line of incision they do not project into the bone cavity; and what is more important, should infection occur in the line of section, the bone cavity is not involved. The resulting scar of this incision is inconsiderable, and in its major portion corresponds

*Read at the meeting of the Eastern Section of The American Laryngological, Rhinological and Otological Association, Philadelphia, February 9, 1905.

to the hair line or is within it. Better apposition of the lips of the wound is obtained when the section is made far back, as it is then "bolstered up," or splinted, by the even surface of the mastoid cortex. This is an important point and has a direct bearing upon the size of the resulting scar. The approximation of the lips of the wound can be made with nicety when the section is so placed.

When the incision is made near the line of auricular attachment to the head, the lips of the wound having no support, tend, when sutured, to invert into the bone excavation; nor does this tendency cease even if we overcome it, at the time when the sutures are tied. The gauze packing in the bone cavity does not form an even and firm support, and pressure from without by the bandage is continually exerted upon this irregular base. Not only will the resulting scar of this incision be generally larger than that of the incision placed further back, but in addition it shows a tendency to become depressed.

Careful observation will also establish the fact that the section when made close to the line of auricular attachment to the head is more likely to suppurate. When infection occurs, with the incision so placed, the bone cavity is at a decided disadvantage, and the whole wound not infrequently must be opened.

The knife should sink to the bone all along this curve, except in that part above the posterior zygomatic root; here only down to the temporal fascia. To sever the temporal muscle is unnecessary, as with a hoe-shaped (Langenbeck's) periosteal elevator, the muscle can be retracted upward without injury. The division of the temporal muscle contributes little to the forward displacement of the auricle. To sever the cutaneous structures only, and to avoid cutting the muscle, grasp the pinna of the ear between the thumb and first finger, and, while making the incision in its upper portion, pull the auricle in a direction from the head, thereby lifting the adjacent scalp from its base, the temporal fascia and muscle. The disadvantage of dividing this structure arises when infection occurs. To this accident we are always liable, for in this operation our asepsis is but relative.

On several occasions, I have seen a complete undermining of the temporal muscle, this structure resting upon a bed of pus, and in one of these cases considerable portions of the muscle were cast off as slough. When the temporal fascia

and muscle are undivided the fascia acts as a shed to any superficial infection; when severed it is as a roof that has a hole in it. Suppuration occurring in the planes of the temporal muscle affords an ugly complication, and the division of this structure predisposes the auricle to sag.

The next step is to displace the auricle and flap forward. In doing this the periosteum should not be torn but preserved in its entirety, for the semilunar flap attached to the auricle forms in part the outer wall of the bone cavity, and, when its periosteum is sacrificed, its inner surface facing the bone excavation later becomes a mass of exuberant granulations over which the process of epidermization advances but slowly.

The posterior lip of the curvilinear incision should not be retracted.

The indiscriminate clamping of every oozing blood vessel paves the way for non-union in the postauricular wound. Bruising of tissues should particularly be avoided, and with the retraction of the auricle, the majority of bleeding points will cease without ligation. Those that do not may be tied. Cat-gut ligatures should be used sparingly. Before the final suturing of the wound, after reaction has been discontinued, every vessel which at this time bleeds should be ligated, particularly if skin grafting is to be done at the time of operation (a practice which I do not advocate.)

The cartilagino-membranous canal is next separated from the bony canal, and some gentleness is necessary to avoid tearing the soft tissues. A periosteal elevator or a pair of small blunt-nosed scissors serves this purpose. At this period of the operation, an ordinary sharp retractor is best for holding the detached auricle and flap forward. A strip of gauze introduced through the membranous canal and brought out through the postauricular wound may be used for this purpose, but the cartilagino-membranous funnel is usually torn when the gauze strip is used.

Before proceeding with the bone excavation, we should inform ourselves of the depth and general direction of the auditory canal, ascertaining whether its axis assumes a more vertical or horizontal position than usual, *i. e.*, if the canal "looks" upward and inward, or directly inward. By this, we gauge in a general way the direction in which we should excavate, and get some idea of the depth of the excavation. The removal of bone should be commenced by enlarging with the gouge the postero-superior arc of the bony meatus backward, low-

ering the postero-superior canal wall simultaneously as the excavation is carried inward. This method is advocated instead of that by which the antrum is entered primarily for the reason that by removing the postero-superior canal wall as we proceed inward we utilize it as a guide and cannot miss the antrum. By its removal we create in the beginning of the operation the maximum amount of working room, and by removing the bone from the meatus backward the most favorable route is chosen for avoiding the sinus.

The attempt which we often witness to outline upon the surface of the mastoid the limit of the bone excavation is, in reality, an unconscious effort to prognosticate the limits of the antrum and to prejudge the amount of involvement. It is a waste of time for no other purpose than the indulgence in a guess, and unfortunately if the operator takes this attempt seriously and begins removing the bone near the posterior confines of this mapped out area, instead of working from the meatus backward, he not infrequently enters the sinus or exposes the cerebellum. As a rule the exposure of dura brings with it no evil results, and our admiration for its ability to resist invasion so increases with our familiarity with it, that unconsciously we reach that point where we cease to regard it as an accident. We are in error; for, during the observation of any considerable number of operative cases, there will invariably arise instances of meningitis or intracranial infection, whose origin can be traced to no other palpable source. In children, in whom the membranes are less firmly knit and the avenues of communication with the endocranial lymph sac more open and relatively abundant, dura exposure becomes significant.

The practice of entering the antrum primarily, later removing the posterior bony canal wall, is an unwarrantable procedure, and next to the original Stacke operation, is, at the same time, the most dangerous and inconvenient route that can be chosen, working as we are upon mastoids in which the ordinary relations are notoriously disturbed, performing an operation in which injury to the sinus constitutes an absolute inconvenience, and attempting to reach an unknown location (the antrum) through an insufficient opening, placed at an uncertain point, and without a guide.

If at this period of the operation, *i. e.*, before the antrum is opened, the upper margin of the bone excavation is not carried higher than the roof of the auditory canal, we avoid

the middle fossa. Having once entered the antrum, the upper limit of the bone cavity can be raised until it becomes tangent to the floor of the mid-cranial fossa by removing the over-hanging bone which represents the superior portion of the external antral wall. The lower limit of the mastoid excavation should slope down by an even curve into the floor of the auditory canal.

As the excavation in the bone is carried inward, (and it is always safer to lower the roof of the cavity in advance of its floor, on account of the external semicircular canal and vertical portion of the facial) the antrum, being more superficial than the tympanum, will be entered first. A bridge of bone will then be left separating the mastoid excavation from the inner end of the auditory canal. This bridge represents the extreme inner end of the posterior canal wall and in part the tympanic ring.

A hook-shaped probe then introduced into the antrum and passed through the aditus, its point emerges through the opening in the drum membrane into the inner end of the auditory canal, and in its concavity is held this bridge of bone referred to, and with the removal of which, the antrum and tympanum are merged into one cavity. As the antrum is entered, a bent probe should be made use of to ascertain the limits of this cavity. To have at all times the maximum amount of working room is a desideratum, and we at once enlarge the excavation backward, removing the over-hanging bone as far posteriorly as the probe has revealed the posterior limit of the antrum to be. Superiorly we ascertain the amount of over-hanging bone included between the upper limit of the excavation and the roof of the antrum, *i. e.*, the floor of the mid-cranial fossa, which is our upper limit, and we remove this. We then have the maximum amount of working room through which to attack the tympanum and to remove the "bridge" previously mentioned.

For the enlargement of the excavation outlined above, I know of no instrument which is comparable in safety to the strong round curette, to be used in increasing sizes as the excavation is enlarged. The rim of the bone cavity affords the proper fulcrum, under which circumstance the curette becomes one of the most powerful instruments in the mastoid kit, capable of being used to advantage even in bones of extreme density. The removal of the "bridge" is next to be effected. For this purpose the Jansen forceps has been devised. The

operator skilled in the use of the chisel would, however, scarcely lay aside this instrument to use the forceps; and the same may be said of those accustomed to the curette. My own preference is for the latter instrument. The cutting edge of the curette is placed beneath the bridge, its back faces the internal wall of the aditus, the posterior margin of the excavation gives fulcrum, and by twirling the cutting edge of the instrument through a semicircle, the bridge of bone is easily removed and without danger to other structures, for we are working in a direction which is from within outward, and in this respect the curette is safer than the chisel. At this period of the operation, *i. e.*, during the removal of the bridge, injury to the facial nerve is altogether unnecessary, and moreover is but rarely committed; it is later that the nerve more commonly suffers, and the use of those variously devised instruments for its protection decreases proportionately to the operator's familiarity with the anatomy of the parts; their elimination is a step toward simplicity, and should be encouraged.

The bridge having been divided, the resulting isthmus is widened at the expense of the bone representing its upper pillar, until this superior pillar has been made to recede upward to the under surface of the mid-cranial fossa. With a small curette the remnants of the ossicles (with the exception of the stapes) and the membrana tympani are swept out into the trough of the bony canal, and removed; they may be extracted with the forceps, if visible and present.

Owing to the bleeding from the granulations in the hypotympanum and those in the region of the tube, considerable time is saved and the necessity for sponging lessened by early removing these granulations with a ring curette, and filling the tympanum with adrenalin. The assistant's duty of sponging the tympanic cavity and keeping it cleared of blood, is not an altogether irresponsible trust. A visit to the dead-house, if we choose to make the experiment, will soon convince us that in the act of sponging the stapes is dislocated or driven through the oval window with far more frequency than is generally supposed. To this is often due that dizziness and vertigo which is occasionally to be observed after such operations, and in which injury to the semicircular canal and the structures of the inner tympanic wall has not been committed by the operator. To prevent this accident, it is advisable to diminish as far as possible the amount of sponging, by early removal of granulations and the use of adrenalin and

the complete lowering of the "inferior pillar," *i. e.*, the ridge overlying the vertical portion of the facial nerve and also protecting the stapes, should be reserved as a later step of the operation, the assistant being required to sponge over this ridge from the direction of the mastoid excavation, and not through the bony canal.

The external attic wall should next be removed. With this a distinct advance was made in the technique of the operation. When this ledge is allowed to remain it often conceals diseased pneumatic structures which keep up a protracted supuration. Particular attention should be paid to the extreme anterior end of this ledge; it should be thoroughly removed and not allowed to remain as an irregularity in the upper and anterior portion of the vault of the cavity. The dome of the excavation as it curves forward should pass insensibly into the curve of the inner end of the anterior wall of the auditory canal, it should be smooth and even, with no irregularities, and all pneumatic structure should have been removed.

The next step is the lowering of the "inferior pillar," *i. e.*, the ridge which overlies the vertical portion of the facial nerve, and sometimes is referred to as the facial ridge. The failure to sufficiently lower this is responsible for many an unsuccessful outcome. When left high it shuts off the mastoid excavation from the tympanum to such an extent that proper drainage of the former cavity is not secured; secretions stagnate therein, profuse granulations arise, and the posterior portion of the cavity is cut off from inspection.

As we dress the wound through the meatus we are forced to pack the mastoid portion of the cavity over the brow of the hill. As the patient lies in the operative position (except in anomalous positions of the nerve, which are rare) this ridge from the floor of the aditus to the floor of the auditory canal, can be safely lowered till level with the summit of the external semicircular canal. For this purpose I prefer a broad, round-nosed curette with its cutting edge turned slightly backward. We occasionally see the rongeur used. This is of all instruments the most dangerous in this locality, for the ridge is composed of exceedingly brittle bone and often fractures far beyond the bite of the forceps, the fracture not infrequently involving the Fallopian canal.

By holding the curette vertically, placing its nose upon the summit of the external semicircular canal, using the superior

rim of the bone cavity as a fulcrum, and working toward the tip, the ridge can be shaved down to the desired level with the utmost ease, and the danger of injuring the nerve is practically eliminated; for the plane of action of the curette is either parallel to the course of the nerve or else in the direction from it, and the cutting edge is (if the instrument be held vertically) slightly above the convexity of its nose. Even though the nose of the instrument rests upon an exposed nerve, that structure is practically insured from being cut across. Not only is the curette more effective here than the chisel, but, what is more important, it is immeasurably safer.

Even in anomalous positions of the nerve, in which the nerve in its vertical portion rises superficially, and is consequently more oblique, there is, when using the curette as above described, but little danger of injuring it. The intratympanic horizontal portion of the Fallopian canal is always to be seen at this period of the operation, and if we choose we can follow the nerve in whatever direction it may take, exactly as we would a blood vessel after having once found it. The danger of the chisel is that we have to work from without, inward, never knowing that the nerve may not be at the point we are chiselling. The safety of the curette lies in the fact that we see the level of the nerve, or rather a point immediately above it, the external semicircular canal, and commence the removal of the superimposed ridge from that point, working from within outward. I have never seen a nerve paralyzed by the curette when used in the manner above described. Owing to the small, pit-like character of the cavity when the chisel is used for shaving down this ridge, its action is not only from without inward—the direction of danger—but from the nature of the instrument, the plane in which it cuts, if continued (as by a slip) crosses the course of the facial nerve. For any instrument to embody the quality of safety, its action must be parallel to the course of the nerve, and the chisel cannot meet that requirement. So far as I have been able to observe, the advocates of the chisel are forced to either of two disadvantages:

First, in order to insure a proper lowering of the ridge, the mastoid excavation is unnecessarily enlarged, and for no other reason than that the instrument can then be used at a safer angle, *i. e.*, in a direction more nearly parallel to the course of the nerve. This is one reason why many advocates of the chisel insist upon making an unnecessarily large mas-

toid excavation, even though the vertical process of the mastoid is in no way involved. It secures a large amount of working room which, for the safe use of the chisel in the locality above referred to, is a necessity; but this delays epidermization.

Secondly, if the limits of the cavity are confined to their proper proportions, it is with great danger to the nerve that the ridge can be lowered to its most advantageous level with a chisel, and this requirement is more rarely met with than it should be. Not that recoveries do not occur with the ridge improperly levelled, but it is to commit an error of technique which, if persisted in, will contribute in a series of cases its percentage to the failures. When, for instance, the hypotympanic space is deep, lowering of the ridge to its absolute limit becomes a necessity.

The inner end of the floor of the auditory canal should be lowered until it recedes to the level of the floor of the hypotympanum; in other words, the external wall of the hypotympanum should be removed. As the cavity is then dressed through the meatus, its floor in all its parts is open to inspection, the round and oval windows are easily to be seen, and there is no portion of the cavity shielded from the eye. The failure to remove the external wall of the hypotympanum is a common but grievous error; depending upon the depth of the hypotympanum,* which varies with the individual bone, secretions effectively stagnate, a pit for concealed granulations is afforded, and the cavity justly deserves its name "the cellar."

Immediately posterior to the round window and in a posterior portion of the hypotympanum, there are often to be found pneumatic cells, which, if the external cellar wall is not removed, remain hidden and keep up a protracted suppuration. These cells, after the above requirement has been met, may be removed under direct inspection, and the danger of injuring the nerve is thus lessened.

For the lowering of the inner end of the floor of the auditory canal, both the chisel and the gouge are eminently instruments of danger for the reason that this bone is intensely hard and brittle, it requires considerable of a stroke of the mallet to engage a bite of it, and to remove it, and when it gives it does so with a suddenness. The point of the instru-

*Politzer: "Inferior Tympanic Cavity." Kretschmann: "Cavum hypotympanicum." Grunert; Koerner: "Cellar." Extends from the inferior border of the sulcus tympanicus to the floor of the tympanum.

ment, directed from without inward, may, if by chance the chisel slips or the stroke of the mallet be misjudged and in excess of that needed, produce injury to the following structures: the dome of the jugular bulb, the facial nerve, the joint of the inferior maxilla, the structures of the internal tympanic wall; and at times the carotid artery is not so very far distant. Each of these accidents, with the exception of the latter, I have seen occur to experienced manipulators of the chisel. The most common injury is to the facial nerve. A safer instrument by far is a round curette with its cutting edge turned slightly backward, to be used from within outward, in a direction away from the structures mentioned above. Provided the instrument be used as a cutting instrument and not as a pry, it works admirably.

A factor which on paper seems unworthy of note, but which in actual experience often amounts to a handicap, particularly to one who operates but infrequently, is that at this period of the operation the fingers by constant holding of the chisel have become tired and cramped, and are incapable of their best effort at a time when this is most needed.

It not infrequently happens that the floor of the auditory canal presents about its middle, from without inward, a marked convexity. Particularly is this true of those canals whose antero-posterior diameters are short, in other words, in a canal the cross section of which represents an ellipse with its long axis inclining to the vertical. This hump should be levelled, otherwise, as we view the cavity through the meatus, the floor of what was the hypotympanum remains hidden from view.

The next step is to widen the floor, or trough, of the auditory canal at the expense of the base of its anterior wall. In some instances this is unnecessary, but in others the anterior wall of the auditory canal presents a marked convexity backward, so that in attempting to see the region of the tube through an artificial meatus of moderate size, our view is hidden by the curve of the anterior canal wall. This wall is an exceedingly thin, brittle partition of bone separating the lumen of the auditory canal from the joint of the inferior maxilla. A vertical section will, however, reveal the fact that the partition is thicker at its base than at a point higher up.

With a sharp, round curette it is possible to gain (and with safety) considerable space by removing thin shavings of bone from the prominence of the convexity, and particularly

from the base of the anterior wall of the auditory canal. It is surprising to see how much the field of view can be enlarged with the removal of a minute shaving of bone, and until every portion of the bone cavity has been made easily accessible to the eye through the meatus, we have fallen short of a proper ideal. My reason for advocating the last mentioned procedure is to avoid having to make an unnecessarily large and consequently deforming meatus in order to get a proper view of the region of the tube. By carrying out the above procedure, the meatus in the vast majority of cases can be kept within cosmetic limits and need not be noticeably enlarged.

We occasionally meet with a bone in which the convexity of the anterior canal wall is so marked that we cannot lessen this to the required degree without endangering the joint cavity. Inasmuch as a proper view of the region of the tube must be had, we then must make an opening in the concha sufficient for that purpose, regardless of the appearance.

The region of the tube is essentially a region of trouble, but to the tube itself failures are often attributed for which it is not responsible.

One of the most important of these is the failure to remove the extreme anterior portion of the annulus tympanicus. When this structure is prominent, as we look forward at the tube from the mastoid excavation, the annulus presents the appearance of a rim or flange of hard white bone which juts out into the lumen of the cavity, which partially conceals the mouth of the tube, and under the ledge of which granulations are easily overlooked. These granulations having been thoroughly removed, the rim of the annulus, the lip overhanging the tube orifice, should be removed so that the anterior portion of the tympanic cavity will resemble in shape the small end of an almond with its sides converging and with the smooth and round end of the tube at its apex. A very small, round curette or a burr may be used to remove this portion of the annulus.

One great disadvantage of allowing the annulus to remain is witnessed during the period of healing. As the process of epidermization advances toward the region of the tube, upon reaching the rim of the annulus, the course of epithelial growth is suddenly diverted and directed out into the lumen of the cavity, the flange of the annulus acting as a jetty, onto which the epithelium runs. As cell proliferation continues

the summit of this jetty by the piling up of its epithelium, is gradually made to extend across the cavity to the anterior portion of the internal tympanic wall. The extreme anterior portion of the tympanum and the mouth of the tube are then shut off from the main cavity by this epithelial curtain, anterior to which granulations form. In some instances the curtain is incomplete and sickle-shaped. In looking into such a cavity we are frequently struck by what appears to be a perfect result. Upon careful examination, however, it will be seen that from the extreme anterior end of the cavity a crust may be removed, beneath which there may appear either a point of pus or a granulation, presumably at the mouth of the tube. This apparent mouth of the tube is, however, nothing more than a hole in the "curtain" to allow of the escape of fluid contents pocketed anterior to it. When the curtain is broken down the true condition is revealed, but inasmuch as the annulus remains, the curtain is liable to reform, and once we have failed to remove the annulus at the time of operation it practically becomes impossible to do so later; depending upon the prominence of this structure, which varies with the individual bone, is the likelihood of trouble. This complication can be prevented by either primary or secondary grafting or by firm packing, and is most commonly seen in cases which are not grafted and in which little or no packing has been used.

The accessible portion of the tensor tympani muscle and cochleariformis, the semi-canal or curled lip of bone supporting the tensor tympani muscle, should be destroyed; otherwise the tube, considered from a surgical standpoint, is divided into an incomplete upper and lower compartment, and though the tube proper (the lower) is thoroughly curetted and cleaned, granulations persist in the upper portion and keep up a protracted suppuration. Another source of considerable and frequent annoyance is the failure to remove the diseased cells often found in the vicinity of the tympanic orifice of the tube and for which the tube is generally held responsible.

Before making the flaps, in order to insure as clean a cavity as possible, irrigation with normal salt solution, followed by ninety-five per cent. alcohol, should be practiced, and particular care should be exercised in wiping out the cartilaginous canal. A temporary pledget of gauze should be placed in the tympanic cavity and the mouth of the tube packed off.

One of the most important features of the operation is the

making of a proper meatus and flaps. The failure to succeed in this is a fatal error to a good result, and the mistake when made, most commonly consists in not securing a sufficiently large opening through which to dress the cavity. It may be stated without reserve that the natural meatus must be enlarged, and if we fail to do this we may expect uniformly poor results after prolonged treatment. Nor is a normal sized meatus desired, even though we could secure this and at the same time get a good temporary healing of the cavity. These meati often show a tendency to contract, and we have not finished with a radical operation upon the epidermization of the cavity. When we ignore the possibility of future complications and fail to provide a proper opening through which to see and treat the cavity, should these occur, we have failed to either appreciate the significance or the scope of the surgical problem with which we are confronted.

In the vast majority of cases, it is unnecessary to noticeably enlarge the meatus, *i. e.*, to enlarge it to the point of cosmetic defect. When the meatus is made shapely and in accordance with the natural outlines of the orifice, a much larger opening can be made without its attracting attention than when the opening is irregular and unshapely.

After a trial of the various flaps which have been advocated I am of the opinion that an essential feature to a good flap is, that it be made so as to allow at least a small portion of it to be turned down, sufficient, that is, to give the lower flap the proper direction for growth and to prevent its curling upon itself, and to some extent to cover the inferior pillar (the facial ridge).

The flap from which I have obtained the best uniform results is made as follows: The point of the knife is placed at the junction of the lower and middle thirds of the cartilaginous meatus, in its posterior half, and from before backwards is made to pierce of the auricle. The incision is then carried horizontally outward into the concha for a distance sufficient to insure a good opening. It is then curved upward, and as it continues, a trifle forward, and terminates on a level with and immediately behind the postero-superior margin of the cartilaginous meatus. The posterior wall of the cartilagino-membranous funnel is then slit inward to its apex, and so divided as to give the upper two-thirds of its length to the upper flap, the lower third to the lower flap. As the above incision is carried out into the concha and as it curves

forward, the knife is so held as to allow the entire incision to be bevelled at the expense of the posterior surface of the concha.

So far as I know, this is a point which has not been embraced in any flap yet advocated. The advantage to be derived from bevelling the posterior surface of the artificial meatus is, that as we dress the wound and insert into the meatus the cylinder of gauze to hold it open, the plug carries before it and infolds the bevelled edge, and epidermization proceeds rapidly, for the infolded skin margin is at once given the proper direction in which to grow. This infolded edge, moreover, protects a rim of otherwise bare and exposed cartilage, and those of us who have ever had the misfortune to have developed here a perichondritis will adopt any means to avoid a second. It decidedly lessens the likelihood of such a complication; it prevents the formation of those granulations which generally sprout just within the posterior margin of the artificial meatus and which cause so much delay in the process of epidermization by blocking the attempt of the conchal epithelium to override the cartilaginous rim of the orifice.

The upper flap is next freed of all redundant tissue, the included cartilage is dissected out, and this portion of the flap is now represented by a skin membrane which, as the ear is later drawn back in position and the wound sutured, slides in over the dome of the excavation. Only one catgut suture should be taken to hold this flap in position, and it should pass through the extreme anterior and external edge of the flap; it should be anchored to the upper portion of the anterior lip of the curvilinear wound at a point corresponding to the superior rim of the bone cavity. The temporal muscle as it lies in its undisturbed position offers an inviting point at which to anchor the flap, but it should not be used for this purpose. For some reason it seems particularly prone to become infected under these conditions. The requirement to be met is so to anchor the flap as to prevent its prolapse into the meatus and to hold its outer end up to the vault of the bony cavity, the inner end being held in contact with the dome by the gauze packing introduced through the meatus. When more than one suture is taken, the second suture which is placed at a point in the flap internal to the first, when tied, pulls the flap away from the vault of the cavity and crumples it upon itself. It accomplishes no good purpose, introduces more catgut into the

wound and adds to the probability of infection, and prevents the flap from reaching as far inward over the dome of the cavity as it should; it consequently delays epidermization.

The lower flap representing the inferior third of the membranous canal and meatus, and the inferior third of that portion of the concha used for the purpose of flap formation, is next turned down and held in position by a mattress suture, which is anchored to the anterior lip of the curvilinear wound below. Before this flap is anchored, the cartilage is dissected out as in the upper flap, and before the conchal portion of this flap is turned down the original curvilinear incision in the concha is carried down to the level of the floor of the cartilaginous meatus. The outer end of the lower flap is then represented by a tongue of skin, and as the mattress suture is drawn tight, the inferior flap is held down in contact with the floor of the bone cavity and in proper direction for epidermization to proceed.

The advantage of a slight inferior flap is that it covers a portion of the cavity which is notoriously tardy in becoming epidermized, and certainly the time of healing is shorter than when the entire posterior membranous canal is utilized for an upper flap. When the latter is done a small skin graft should be applied to the inferior pillar (the facial ridge) at the time of operation. If the graft takes, it serves the purpose of the inferior flap, but primary grafts are notoriously uncertain: we are grafting upon a septic base, and when they cover large areas of the cavity, particularly areas which are in proximity to the dura, or if the dura itself is exposed, are not altogether free from danger.

The curvilinear incision should be sutured with silkworm gut; four sutures are generally sufficient, and while these are being introduced, the points of puncture should be supported so as to prevent traction upon the flaps as the needle is passed through the tissues.

The temporary packing is now removed, the cavity wiped dry and packed through the meatus with small squares of gauze. On the third day the cavity is dressed and the sutures removed. As soon as a good firm bed of clean healthy granulations arises, a secondary skin grafting is done through the meatus. It is unnecessary to anesthetize the patient for this purpose; by holding a block of ice upon the thigh for several

minutes, there is little pain, and the vitality of the graft is not impaired.

In an ear which possesses a useful amount of hearing, I do not place grafts immediately over the round and oval window, but graft as close to these as possible without covering them. At the same time the tendency to the formation of granulations is kept down so that the least possible barrier to the sound waves is interposed. The attempt in these cases should be made to get epidermization in this region as quickly as possible with the least amount of tissue blanketing the windows. In order to carry out these manipulations satisfactorily, it is essential that the facial ridge be lowered to its absolute limit, and the pyramid, if prominent, destroyed.

We occasionally get brilliant results by grafting, but often the healing of the cavity is not materially shortened. I think a fair estimate of the value of grafting is, that we may generally expect to shorten the period of healing by several weeks.

An excellent result, whether grafting is or is not practiced, is complete epidermization at the beginning of the fifth week. In cases of encapsulated cholesteatoma the post-auricular wound should be left permanently open; if sutured, we will probably have to reoperate at a later period. All adenoid vegetation should have been removed from the nasopharynx, as it constitutes a menace to the ear cavity.

I do not believe in primary skin grafting as it stands today, and as I have seen it practiced. It is not in accordance with surgical principles. By our operation we have removed the protective barrier of granulations; we have exposed a large area of raw, absorbing surface; we have opened innumerable small vessels, and their mouths stand ready to receive infection; the field is septic, and with our skin grafts we blanket this infected bed, which stands not only in dangerous proximity to, but indirect vessel connection with the endocranial lymph sac. On two occasions I have seen meningitis and death follow primary skin grafting, and in these cases it would have been very difficult to have attributed these deaths to any other cause. I have been unable to get results which would lead me to adopt it as a routine practice, nor have I seen such results obtained by others. In a procedure so simple in its technique it seems strange that operators should so vary in the results reported.

Of 22 consecutive chronic cases, in none of which was the duration of the disease under three years, operated upon ac-

according to the above technique, complete and apparently permanent epidermization has followed 21 times. One patient disappeared from the hospital about the sixth day after the operation, remained without treatment and with a dressing in the ear for two weeks. He returned at the end of this time with an abscess of the auricle, a perichondritis, the meatus completely closed, and the cavity a pool of pus and foul granulations. In this instance curetting of the cavity and a plastic operation was necessary later.

VII.

REPORT OF A CASE OF BRAIN ABSCESS, RESULT- ING FROM CHRONIC PURULENT OTITIS MEDIA.*

BY JAMES F. MCKERNON, M. D.

NEW YORK.

The following case is reported, not because there were any new or unusual diagnostic symptoms presenting, but because the writer believes that every case of brain abscess, whether successful or fatal, should be reported, so that our records in the future, and the statistics taken from them, may be more nearly accurate, and thus enable us to correctly determine the percentage of cases of cerebral suppuration caused by disease of the middle ear.

The history in this case, which terminated fatally, is briefly as follows:

M. G., a girl eleven years of age, was first seen on December 16, 1904. Her mother said that the child had had a running ear on the right side for the past eight years, in consequence of an attack of measles when she was three years old. The mother remembered that twice during the eight years the ear had stopped discharging. Once, when the child was six years old, the discharge had ceased for several months; and again, three years later, there was no discharge for six weeks. With these two exceptions, there had been a continuous discharge of pus from the ear for eight years.

About a year before, she had spoken to her family physician about it and asked him what she should do for it. He told her to let it alone, as it would be very hard to check the discharge; and that when the diseased material had all come away, the ear would get well of itself.

For the past month the mother had noticed that the child was very dull, and often extremely irritable with the other children. At night she was very restless, would grit her teeth,

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and occasionally give a short, sharp cry as if in pain. If awakened at this time and questioned, she would say she had pain all over her head. Four days before I saw her, she vomited, said the daylight hurt her eyes, would not eat and continually complained of headache. During the past three days she had been lying in a stupor, moaning and groaning and tossing from one side of the bed to the other. When aroused, she would attempt to answer a question, but before she could do so, would lapse again into 'unconsciousness. She refused all food. The family physician had been called in to see her several times during the last few days, and had told her mother that the child must be kept quiet. He had given her a hypodermic of morphin at each call.

Physicial examination showed a child apparently about eight years old, very much emaciated, moaning and moving from side to side of the bed. Her color was indicative of sepsis, the tongue was dry, glazed and heavily coated, the eyes were closed tight and her hands were clenched. The temperature by rectum was 97.3 F., the pulse was 52 and the respiration 14 per minute. Examination of the right ear disclosed a large polypoid mass completely filling the external auditory canal and meatus. This was covered with a thin but very foul-smelling discharge.

The mastoid was normal in appearance, the left ear was negative. A diagnosis of brain abscess was made, and the mother was told of the critical condition of the child. She said if there was a possible chance of saving the child's life by an operation, she wished it done. She was then told that at that late day, even with an operation, the child would in all probability die in a few hours. Notwithstanding this, she requested that an operation be performed as speedily as possible.

A hasty preparation was made, and within an hour the child was on the operating table. While preparing for the operation, one of the assistants examined the eyes, and reported double choked discs.

Operation: Chloroform in small quantity was administered. Feeling certain that we had a cerebral abscess present, I decided to expose the brain primarily, and chose as the point for entering the skull a space near the floor of the middle fossa, corresponding to a point directly above the mastoid antrum, as I believe, in children, cerebral infection occurs more frequently by an extension from the mastoid antrum through its roof than by way of the tegmen or other portions of the bone.

The dura was exposed rapidly to about the size of a silver half dollar, the lower margin of the opening being as low down as the floor of the middle fossa. The exposed dura was not at all dark in color, but rather white or grayish, and devoid of lustre, and did not show any undue prominence by bulging into the opening made by the removal of the bone. It was incised freely with a scalpel, and sutures introduced to act as retractors. Upon exposing the cerebral substance, it was found to be lustreless also, and did not bulge prominently into the openings through the dural flaps. A knife with a long slender blade was introduced just above the bony floor, and directed upward for about one inch. Before the blade could be withdrawn, pus gushed through the opening with such force that it was carried as far as the elbow of the operator, as though propelled by a pump. The opening to the cerebral cavity was enlarged by the introduction of the finger, and it was estimated that between three and four ounces of pus had been contained in the cavity. Certainly it was the largest amount of pus I have ever seen coming from the cranial cavity. The abscess wall was composed of a limiting membrane and the cavity was cleansed by wiping it out with narrow strips of gauze.

Upon inquiring of the anesthetist the patient's condition, I was told that the pulse had gradually increased in rapidity to 90 per minute, was of good force, and the respirations higher than before.

Owing to the improvement in the patient's condition, it was decided to open the mastoid. This was quickly done, and it was found to be necrotic throughout, and completely filled with a cholesteatomatous mass which was removed.

Into the brain cavity was inserted a wick of sterile gauze moistened and rolled in equal parts of boric acid and iodoform powder. The wound was dressed as rapidly as possible and the patient placed in bed. The time consumed in the operation and dressing did not exceed twenty-five minutes. A saline solution was thrown into the bowel to forestall any sudden collapse.

The patient did well, the pulse increased to 120 per minute, the respirations were only slightly above normal and the temperature rose to 102 F. She became conscious, asked for a drink, and said her head pained her, but not as badly as it did in the morning. In about an hour she became worse, the temperature arose to 106 F., pulse 180 and respiration loud and snoring in character; and within another hour she was dead, having survived the operation about eight hours.

The pus was examined bacteriologically, and found to contain a mixed infection. It had an extremely foul odor as is usual in abscess cases of long duration.

The history of this and similar cases teaches us how extremely dangerous it is to allow a chronic suppuration of the middle ear to continue unchecked. But while we, as otologists, recognize the danger, does the average general practitioner of medicine to-day so recognize it? While some may, I do not believe the vast majority do. If they do not, is there anything that we, who are practicing this especial branch of medicine, can do in the future to enlighten them?

I think we can, and the first step in the right direction is to teach the medical student of to-day, who will be the general practitioner of tomorrow, how to recognize and properly treat acute affections of the middle ear, for if so treated an acute inflammatory process need rarely become chronic. If it should become so, we should insist upon his knowing the danger that may arise from a continuance of this condition, and the appropriate surgical treatment for its relief.

62 West 52d Street.

VIII.

A CASE OF SARCOMA OF THE MAXILLARY SINUS.*

BY Z. L. LEONARD, M. D.,

NEW YORK.

The case here epitomized presents some features which may be deemed worthy of consideration at this time.

C. H. T., 51 years of age, a merchant, born in New England, of exceptional healthy and long lived ancestry, applied for relief Sept. 15th, 1903. He had recently returned from a month's trip through the West including the Yellowstone Park. It was after a long stage ride in the Park, where he suffered much from the irritation caused by the clouds of alkaline dust, that he had his first attack of epistaxis. During the journey home he was frequently annoyed, more at night, however, than in the daytime, by the bleeding. There was no pain accompanying this bleeding nor was it so excessive that he was forced to consult a surgeon, simple measures staunching it. The hemorrhage was entirely from the right nostril trickling also into the pharynx.

Upon examination, the right inferior turbinate was considerably enlarged but not sensitive to touch by the probe, nor was any painful spot discovered either internally or externally. No bleeding point could be found. The posterior rhinoscopic image was normal. An astringent solution was thrown into the nostril and the patient was ordered to use frequently a spray containing sulphate of zinc. This sufficed until the first of October, two weeks, when he reported again saying that the bleeding had recommenced.

The inferior turbinate had increased in size during the time and was more sensitive but not painful on pressure. Four daily treatments again checked the flow of blood and patient did not call again until the 28th of October, or for more than

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three weeks. At this time the turbinate had increased to such a size that it nearly touched the septum. It had a firm healthy appearance and did not bleed. For the first time the patient spoke of a pain on the right side of the face which he thought was caused by a decayed bicuspid tooth. Antral disease was suspected but these were the first symptoms which could be elicited from the patient which might be a ground for such a suspicion. He had already consulted a dentist who began the treatment of the tooth with the hope of saving it. The epistaxis came on at regular intervals, usually at night. The patient continued under the care of the dentist through the month of November but with no permanent relief.

Early in December he presented himself again with well marked tenderness of the cheek, but no bulging, neuralgic pains and conjunctivitis. The turbinate had now attached itself to the septum by a web-like membrane through which there were two openings barely admitting a probe. Except for the inability to breathe freely through the nostril he suffered no great inconvenience, but could clean away the mucus with spray and handkerchief. Transillumination gave an umbra extending over the whole maxillary sinus. He was advised to have the bicuspid, which was very tender on pressure, removed at once. This was done, with slight relief, and the dentist referred him back to me, saying there was no drainage and he had done all he could.

On December 11th the patient was etherized preparatory to the removal of the inferior turbinate and for the purpose of making a free opening into the maxillary sinus. The turbinate was extracted with forceps. Passing the finger into the nostril beyond the base of the turbinate it entered the sinus through a wide space in the bony wall and came in contact with a mass, soft and friable. With the finger and curette this mass was removed as thoroughly as possible. The orbital wall had been so destroyed that the eyeball could be readily felt. Its surface was intact, apparently normal. It was then deemed advisable to make a counter-opening through the canine fossa to secure complete drainage. The lip was retracted and the usual incision made. Cutting through the soft tissues the knife immediately penetrated the sinus through another large opening in the bony wall in this locality. Again introducing the finger through this aperture it was discovered that almost the entire wall of the sinus was eroded or missing. As the request had been made that there should be

no external mutilation, further operative interference ceased at this point. The bleeding, which had not been excessive, abated when the parts were washed with hot water. The sinus was firmly packed with iodoform gauze. The patient reacted well, no untoward symptoms arising. A bit of the gauze was withdrawn daily until all had been removed, when a rubber drainage tube was inserted. Through this the sinus was irrigated with a warm saline solution for six weeks. A portion of the mass taken from the sinus was submitted for pathologic examination educing the report that it was a round cell sarcoma, quite vascular and with small hemorrhages in different parts of the growth.

The patient complained no more of pain in the cheek after the operation until March. He ate and slept well, attending to his business every day, going first on New Year's day. The right eye became more involved, with painless loss of the sight, its appearance causing the most annoyance. About the beginning of March there was evidence that the sinus was rapidly filling up again. There was bulging of the whole right side of the face, the eyeball protruding from the orbital space. The floor of the sinus and the alveolar processes were destroyed, allowing the teeth to fall out. Large sloughs extending into the mouth had to be cut away frequently. There was no extension of the growth below the superior maxilla. The function of deglutition was never interferred with materially. Patient died on April 14th, 1904, and no autopsy was allowed.

The antecedent history of this patient was as follows: On March 15th, 1902, a small non-malignant tumor was excised from the vicinity of the left mamma. On the site of this surgery a second growth appeared which was removed on January 26th, 1903. This operation was a thorough one, not alone the growth itself, but also the axillary glands were ablated. This second growth was examined and found to be sarcomatous. On March 15th, 1902, at the first operation, there was no glandular enlargement. Almost immediately after the second operation the patient began to have treatment by the X-ray and injections of the Coley toxin, one day receiving one the next day the other. The toxin was increased to twenty minims to a dose, producing well marked systemic disturbance. This treatment was kept up faithfully until August and resumed in September. Both were continued until

December 17th. From that time on the X-ray was abandoned but the toxin was used until shortly before death.

The details of interest worthy of consideration in connection with this case are: The inexorable advance of the disease notwithstanding the adoption of surgical and therapeutical methods approved and modern to check its progress; the absence of excruciating pain or copious hemorrhage and, most remarkable of all, was the lack of any cerebral symptoms even to the very last. This is especially to be noted since movement was apparently in the direction of the important region lying at the base of the brain. The writer is indebted to Dr. D. M. Marvin, the family physician, for many valuable facts in relation to this case.

19 W. 120th Street.

IX.

CARIES OF BOTH PETROUS PYRAMIDS—REMOVAL OF THE ENTIRE PETROUS PORTION OF THE CRANIAL BASE AFTER DOUBLE PETROMASTOID OPENING, PERMITTING TRANSMASTOID ENDOCRANIAL COMMUNICATION—OPERATIVE CURE—DEATH FROM TUBERCULOSIS OF THE LUNGS—REMARKS UPON THE TECHNIQUE OF OF PETROUS ABLATION.*

BY DR. PIERRE CAUZARD,

PARIS.

The case which I am about to report appears interesting:

1. In the absence of meningeal or cerebral symptoms.
2. In the extent of the lesions.
3. In the importance of the osseous resection and ablation, that is to say, the removal of one of the most important parts of the cranial floor, permitting thus the traversing of the endocranium, from left to right or right to left, by means of a long probe.
4. Complete preservation of the right facial; partial preservation of the left.
5. Operative cure, without meningeal, cerebral or bulbar symptoms.

A young man, 18 years old, was sent to me with suppuration of both ears, in May, 1903. The patient was of feeble constitution, that of a child of 12 or 13. In infancy he had had measles and scarlatina; his ears had suppurated since the age of 7 or 8. At the age of 15 he had been operated upon for adenoids. After the operation the purulent discharge had been more abundant and the patient had increasing difficulty

*Read before the International Congress of Otology, Bordeaux, 1904.

in opening the mouth. For over a year he had been unable to masticate and subsisted upon liquid and semi-liquid food.

Family history: Father died of tuberculosis; mother in good health.

First examination, May 30, 1903. Abundant purulent discharge from both external auditory canals and the nasal fossae. With the probe a sequestrum was felt in each canal beyond the limits of the internal wall of the tympanum. The patient could hardly separate his jaws; however hypertrophied tonsils and abundant pus descending from the pharynx were seen. Teeth carious. Stomatitis.

Diagnosis: Caries of both petrous.

Treatment: Free lavage. Operation upon both sides was proposed.

The patient returned April 2, 1904. Same condition as before. In December, 1903, the patient had vertigo for three days, then ceasing entirely. Frequent nuchal headache; no facial paralysis; trismus augmented; gingivitis, stomatitis; flow of pus from the pharynx, nares and ears; upon lavage of the ears water escaped through the nose and throat. Two weeks previously the patient had expectorated something which, from the description given, we thought might have been a small sequestrum from one of the petrous. By exploration of both tympani with the probe, sequestra were felt; on the left the probe extended to a depth of over 6 cm. from the tragus; the patient did not complain of vertigo or tinnitus. Deafness was not absolute, but increased. The patient heard loud voice at 2 or 3 cm.; the fork on the mastoid was heard on the right. General condition bad; the patient was emaciated, there was infiltration of the right apex, and thoracic expansion was small. Urine contained neither albumin nor sugar. Operation was again proposed and was accepted.

Operation upon the left side, May 21, 1904. Thinking that the antrum could not be uninvolved, although there were no signs of antritis, I began by making a petro-mastoid opening (classic operation).

1. The petro-mastoid opening: Retroauricular incision in the shape of a T; abundant vascularization; antrotomy; antrum filled with granulations. With the forceps I broke away nearly all the mastoid down to the internal wall, laying bare the lateral sinus, which was healthy. The aditus was opened freely; the tympanum was hardly recognizable, having

become a vast cavity filled with granulations and sequestra, which were removed with the curette. The tegmen was destroyed; the labyrinth and the petrous were represented by a deep seated sequestrum.

2. Resection of the squamous. The lesions extending into the temporal fossa, I prolonged the cutaneous incision upward and rugined a large portion of the squamous, which I freely resected, laying bare the dura mater covered with granulations which were curetted away. Because of the diseased bone, and in order to reach the diseased pyramid, I resected the entire antero-superior long wall of the auditory canal, the root of the zygomatic process and the tympanal portion of the auditory canal, thus removing the postero-superior wall of the articular cavity, which received the condyle of the inferior maxilla. The auditory canal in the temporal was thus completely destroyed, the wall over the facial nerve curetted and gouged away, and the facial uncovered. Turning aside the temporal lobe there was revealed a regular well almost filled with a large sequestrum and surrounded by pus and bleeding granulations.

3. Morcellation and extraction of the petrous sequestrum. A probe penetrated deeply along the sequestrum, going beyond the median plane, gliding in front of the bulb and entering the opposite cranial hemisphere. I finally morcellated and freed the sequestrum, which represented the whole of the necrosed pyramid. This part of the operation was most laborious, but, by the morcellation, I was able to extract all the sequestrum, but without being able to avoid wounding the facial, as was shown by a few muscular contractions of the face. The extraction finished, there remained a pyramidal cavity over $\frac{1}{2}$ cm. deep, having the general outline of the petrous, the apex corresponding to the apex of the other pyramid, the base represented by the external opening made at the expense of the canal, the tympanum and mastoid. The superior wall of the cavity was formed by the dura mater covering the temporal lobe; the posterior wall was made by the cerebellar dura mater and the corresponding lobe of the cerebellum, more deeply by the medulla; the anterior wall was the posterior portion of the temporo-maxillary joint capsule, a part of the temporal and the great wing of the sphenoid, and more deeply by the basilar groove and its suture with the body of the sphenoid.

Warm lavage was attempted, but the patient was attacked

with cardiac and respiratory syncope, arrest of the pulse, heat and respiration; the corneae became dull and the skin livid.

Artificial respiration was done, together with rhythmic traction upon the tongue, the precordia was cauterized, and two injections of ether were given. After 7 or 8 minutes the pulse reappeared, although very irregular, and respiration was re-established. The syncope appears to me to have been of bulbar origin, provoked by contact of the lavage with the bulbar region, as the introduction of a small quantity of solution into the larynx and trachea would hardly account for it.

The wound being cleared out it presented itself as a large hole, wide without, directed inward and slightly forward, narrowing and dividing into two cavities forming a Y. The anterior cavity, very short, opened into the cavum, permitting a view of the left aspect of the vomer, and the left choana. It passed in front of the basilar process and the sphenoid, behind which was the other cavity, extending deeply as far as the petrous of the other side, beyond the anterior aspect of the bulb. Hemostasis was easily obtained after resection of the entire membranous canal. I tamponed with iodoform gauze and dressed with sterile cotton. The operation lasted nearly an hour and a half. The other side was dressed. I took note that the lavage water thrown into the left side escaped through the right canal.

Subsequent course almost normal. The patient regained complete consciousness. There was complete left facial paralysis. The following treatment was instituted: (1) Three full lavages of the right ear with a 10 to 1000 solution of sulphate of soda and chlorid of sodium; (2) a subcutaneous injection of 500 c. c. of saline; (3) lavage of the bowels with a litre of saline.

First week: Disappearance of the headache; persistence of the facial paralysis; evening rise of temperature not above 37° C. Congestion at the base of both lungs, with intercostal pain. Revulsives and tonics given. On the second and fourth days, after operation the patient expectorated two small sequestra.

First dressing, May 28: Wound of normal appearance, no suppuration. It was easily cleaned with tampons of dry cotton and mopping the cavity with peroxid. When the right ear was irrigated the fluid came out the right naris, but the stream could be easily seen in the bottom of the wound.

Second week: Injections of cacodylate of soda; intestinal

lavage; feeding easier and more abundant. Locally, three large irrigations of the right ear were given, which continued to suppurate freely. The mental state was excellent; the intelligence was alert; there were no bulbar symptoms, no oculo-motor paralysis. The pulse was between 90 and 100; temperature between 37 and 38 C. In the course of the week showed considerable intermittence.

Second dressing, June 4: After dressing, the temperature become normal, in the neighborhood of 37 C.; pulse about 90, regular. Auscultation, however, revealed progressive tuberculous lesions.

Third dressing, June 11: Epidermization was rapid. At the bottom of the wound was mucus, apparently coming from the cavum. The patient got up. He had no difficulty in standing, no headache, no vomiting. Mastication became more and more easy, the trismus being less severe.

Fourth dressing, June 18: Epidermization had reached the bottom of the wound and cure was progressing. The temperature ranged between 37 and 38, but seeming good, we decided to attack the other focus of suppuration.

Second operation—Right side (June 29, 1904):

1. Petro-mastoid opening. Retroauricular incision in the form of a T. Stripping off the periosteum I found a spontaneous perforation over the antrum, the size of a 50 centime piece. There was no other sign of antritis. Mastoid filled with cholesteatomatous matter which was cleaned out and freely curetted. Behind was the lateral sinus, separated from the integument by an extremely thin shell (1 millimeter), a rarity to which I call attention. The bony septum of the aditus was destroyed.

2. Temporal resection. Resection of the superior border of the canal, of the longitudinal root of the zygomatic process and the tympanal portion of the temporal, and a small portion of the squamous. Destruction of the tegmen tympani.

3. Morecellation of the petrous. The bed of the facial nerve and the labyrinth were destroyed with the chisel and curette. The sequestra were carefully removed after they had been, with difficulty, detached from the facial nerve, which transversed the operative field from above downward, from behind forward, and from within outward, that is to say, from its origin to the stylomastoid foramen, its intrapetrous path no longer existing. With a Kocher forceps I removed the osseous debris, which represented the remnants of the petrous apex,

without injuring the carotid artery. I was then stopped by a fibrous partition separating the operation wound on the right side from that of the left. This partition was formed of periosteum and dura mater, one portion extending from the right outer border of the basilar process to the posterior part of the internal border of the great sphenoid wing, thus separating the cranial cavity from the right choana; the other portion stretched backward toward the bulbar dura mater. It had two openings; one, the anterior, permitted the introduction of a probe into the right choana as far as the vomer; the other, posterior, allowed the passage of a long probe from the operation wound on the right side through to that of the left side, thus passing between the basilar groove and the anterior aspect of the bulb. I was able, then, to traverse with a probe the lower portion of the cranial cavity, entering the right mastoid antrum and coming out through that of the opposite side. This I call transmastoid endocranial transfixation. The operation was finished; the cavity was packed with iodoform gauze; the opposite side, which was healing rapidly, was dressed.

First week, June 27 to July 2: General condition satisfactory. The temperature did not go above 38. The patient fed himself much more easily, as he could masticate better than for nearly two years. Trismus much diminished. The pain caused by the motion at the temporo-maxillary articulation no longer existing, he spoke with greater ease. No right facial paralysis; on the left side he was now able to close the eye, and the facial distortion was less pronounced. The left facial had not, therefore, been destroyed, but wounded.

First dressing, July 2: On the right the wound looked well in the temporal portion; suppuration in the lower part, the cervical region. On the left, superficial cauterization was complete; the skin had covered over the dura mater and the inferior surface of the temporal lobe. In masticatory movements the maxillary condyles on both sides could be seen rotating in the joint capsule, which was in direct relation with the wound. I was still able to traverse the cranial base with a probe from mastoid to mastoid.

Second week, July 2 to 9: The temperature was very irregular, but not exceeding 38.4. Pulse about 90. Patient dyspneic. However, he was able to stand up a little without vertigo, headache or trouble in standing. July 9, on examining the chest, a large cavity was found in the apex of the right

lung, the evolution of which had been rapid. Over the extent of both lungs there was fine subcrepitant rales. The patient did not cough or expectorate. Profuse sweats.

Dressing: On the left cicatrization well advanced. On the right the wound was suppurating; superficial epidermization. Packing with iodoform gauze.

July 9 to 14 the temperature varied between 37 and 39. General condition became very bad. Increased dyspnea. Auscultation of the lungs showed complete tuberculosis invasion.

Dressing: On the left continued improvement, which was astonishing, in view of the general condition; right stationary. Iodoform gauze.

The patient died July 17, with consciousness unimpaired, and without bulbar, meningeal or cerebral symptoms. It appeared as if the second anesthesia, with chloroform, like the first, accelerated the pulmonary tuberculosis. The question also arises whether or not two operations upon tuberculous lesions might have provoked the rapid spread in the lungs.

REMARKS.

From the history of the case we may deduce:

(1) The possibility of surviving the double operation, ablation of both petrous processes; that is to say, ablation of an entire part of the cranial floor, death having been due to the pulmonary lesions.

2. It seems that to perform total ablation of the petrous processes it is better to go through the temporal region—the squamous. It is easy thus to lay back the temporal lobe after detaching the dura mater from the squamous. After my experience with these two ablations I propose to operate thus:

OPERATIVE TECHNIQUE.

(1) Classical petro-mastoid opening.

(2) Detachment of the periosteum from the squamous.

(3) Resection from the squamous of a semicircle with a radius of 2 or $2\frac{1}{2}$ cm., the center corresponding to the auditory canal. This circle should have its base situated upon a horizontal plane passing through the inferior border of the bony canal, thus including resection of all the longitudinal root of the zygomatic process.

(4) Resection of all the tympanal portion of the bony canal, that is to say, the antero-inferior wall of the canal. For all these resections employ only forceps, and not the chisel and hammer.

(5) Turn back the temporal lobe covered with dura mater.

(6) Dissect out the facial, a delicate operation, but facilitated by the previous resection and the lessened resistance of necrotic bone.

(7) Morcellation of the sequestrum, avoiding the carotid, the position of which should always be previously determined. Take a temporal bone, look at the carotid canal; it is very thin, and in necrosis of the petrous it is one of the first parts to be destroyed. The carotid is then surrounded by dura mater, and the internal border of the great wing of the sphenoid. (In my two operations I did not have to concern myself with this).

In breaking up the sequestrum beware of mislicks backward, for the instrument is not far from the basilar groove, that is to say, the bulb.

With prudence, sponging deeply and frequently, so as to give a clear view, and using the hand mirror, the operation is easily managed.

I wish to caution against lavage or the introduction of fluids in any form.

The dressing should be a firm packing of antiseptic gauze, preferably iodoform.

As the operation wound communicates with the pharynx and nasal fossae simple sterile gauze would soon become infectious. The packing should be done carefully and firmly, so as to make a barrier between the pharynx and the dura mater protecting the bulb and encephalon.

X.

ON THE RELATIVE FREQUENCY OF THE DENTAL AND NASAL ORIGIN OF ANTRAL EMPYEMATA*.

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The question of the origin of antral empyemata is one that has occasioned considerable discussion. Originally the dental profession had the entire field, but of late the nose and throat specialist is probably seeing relatively more cases as an individual than is the individual dentist, and whereas originally we thought most of them to be of dental origin, at the present time I think the consensus of opinion would rather be that the majority of them would prove of nasal rather than of dental origin, although when one comes to search the literature in regard to it, one meets with the most various opinions, varying somewhat with what has been the author's individual experience. Without wearying you with citations from a large number of authors which would have no especial value, I nevertheless wish to make a few quotations from the recent literature on the subject from three authors, and then wish to give you my own personal observations in regard to the subject.

In the *Monatsschrift für Ohrenheilkunde* of June, 1904, Dr. Alexander Strubell, of Dresden, has a very exhaustive article on the relationship of the vessels of the antrum to those of the teeth. Finding that there was the greatest variation in the opinions expressed by so-called authorities; finding also that there are apparently cases of dental origin of antral empyemata in which there is no communication with the antrum to

*Portion of address delivered before the Harvard Odontological Society December 15, 1904, on the "Relation of the Dentist to the Ear, Nose and Throat Specialist," and extracted from the International Dental Journal.

be seen, and yet in which the clinical history would seem to admit of no doubt that such cases of empyemata had originated from the teeth, he set out to see if he could not anatomically find some relationship between the vessels of the teeth and those of the antrum, or at last some condition that is not as yet fully understood, by which the pathogenic focus could be carried to the antrum mucous membrane. There being no especial lymph-tract, only the blood-current was left, and the question then was whether there were any existing anastomoses between the blood-vessels of the alveolus and the mucous membrane of the antrum, sufficiently related together to render the theory of infection from one channel to the other plausible.

In most anatomic writings there is nothing concerning this, although Zuckerkandl, in his article in Scheff's "Hand-book of Diseases of the Teeth," states that the vessels that supply the alveolus communicate with those of the external periosteum; that in the upper jaw there is in addition to the external periosteum an inner one, namely, the deep layer of the mucous membrane of the sinus, to which at the same time the arteries of the bone lead, and the veins from which lead to the bone. In a previous publication Zuckerkandl had briefly referred to something of the sort, but as Strubell could find nothing further in anatomic and clinical literature touching this point, he made personal studies on this matter in Professor Zuckerkandl's own laboratory. Tandler's method of injection with sodium iodine, gelatin and Berlin blue was used, and the posterior alveolar arteries were injected. The specimen was then fixed in formol, the lime salts removed in caustic potash and treated with alum, after the method of Schaffer. The sections were made from celloidin. As a result of the examination of the specimens, he found that there were three vessel systems—a long narrow one extending to the deeper layer of the mucous membrane of the antrum, that is, its periosteal layer; a coarse-meshed vessel system of the spongy bone of the upper jaw, and a fine-meshed one corresponding to the alveolus and the covering of the tooth-root; that individually these were very characteristic, but that with one another they had such a close connection that it was very difficult to absolutely differentiate them from the other. The junction of the vessels of the mucous membrane periosteum with that of the bone is brought about through numerous short, thick vessels coursing at short intervals in canals at right angles to the direction of the bone, while the obliquely cours-

ing arteries of the moderate size that bring about the communication between the blood system of the spongy bone with that of the alveolus are re-enforced by a large number of the finest blood-vessels. Here it is seen that the fine capillary system of the spongy bone, whose vessels lie in the marrow of the bone, are connected with those of the alveolus, and prove substantially the theory that the three systems are in foundation one and the same. Hence it seems proper to say that the nourishment of the antrum and its periosteum, the spongy portion of the upper jaw, and the teeth in the alveolus all come from one set of vessels which anastomose with one another in the most extensive way. It is easy therefore to see that inflammation may travel from the antrum to the teeth or from the teeth to the antrum, without there being a direct continuity of the surface or a direct infection from one diseased area to the other.

Strubell then goes on to discuss the question of the relative preponderance of origin between dental and nasal causes, giving the statistics which follow, all of which from European authorities I take from his article with the exception of those of Tilley and Lermoyez, the source of which is stated.

Bayer, of Brussels, thought the most frequent cause of empyema to be disease of the teeth.

Grünwald considered twenty-one out of thirty cases to be dental in origin.

Schiffers, Goodwillie, Moreau, Schmidt, Baginsky, Lublinski, M. Schmidt, Krieg, Schütz, Christopher Heath, Scheff, Heryng, and Schmiegelow, as the result of their clinical observations, consider the teeth to be an etiologic factor.

In an article read before the Odontological Society of London, November 23, 1903 (*Laryngoscope*, February, 1904), by Herbert Tilley, a prominent London laryngologist and surgeon to the Golden Square Hospital for the nose, throat and ear, the one founded by the late Sir Morell Mackenzie, Dr. Tilley reports briefly on sixty-four cases of antral suppuration seen in private practice, and eighteen hospital cases seen since January 1, 1902. Of the sixty-four cases seen in private practice, upon which his paper is based, he found diseased bicuspids or molar teeth to be present, or by their absence implying previous removal for disease, in every case, with one exception, upon the side corresponding to the antral suppuration. He says, further, that during the past ten years, during which he must have seen at least three hundred cases of

antral abscess, he has only met with one patient, a girl aged twelve, in whom the teeth were quite healthy.

B. Fränkel, as a result of his clinical experience, states that in by far the larger number of cases disease of the teeth and alveolæ was the causative factor. For his position he states that he had never seen a case of empyema of the antrum in which the corresponding tooth had not been previously extracted, or was at least diseased. This would agree with the observation of Herbert Tilley just quoted. And his final conclusion is that empyema of the antrum usually has its origin through the alveolus of the teeth.

Hartmann, in one article, stated that in sixteen empyemata only one case originated from a carious tooth. He reported one case of empyema of the antrum where, as the result of filling, or following the filling of a second upper molar, pus developed. The tooth was extracted. It was then easy with a few turns of the borer to go directly from the alveolus into the antrum, after which quite a quantity of pus was removed. Under daily washing healing followed a few weeks after. In another article Hartmann stated that in most cases carious teeth formed the etiologic moment for the antral empyema, but that it was not always possible to determine whether the inflammation of the tooth was the real cause of the inflammation of the antrum. In only two cases after extraction of the tooth did he find an opening directly into the antrum. The fact that, in spite of a previous inflammation of the roots of the tooth, healing of an empyema of the antrum has been brought about through washing out of the nasal cavity, allows us in many cases to say that there is probably no direct union of the antral cavity with the carious process. In one-third of Hartmann's cases there were polyps in the nose, and in these he thought there was a nasal origin of the affection. In twenty-three out of thirty-two cases healing was brought about through regular washing out through the middle fossa of the nose.

Lermoyez (*Journal Laryngology*, 1902, p. 576) states that dental origin is more frequent than nasal origin. This is due to the sudden rupture of the radiculo-dental periapexial abscess into the cavity of the sinus. It is only subsequently that the empyema is transformed into a chronic sinusitis.

Those authors who think that the inflammation comes from the teeth base their propositions on the fact that many tooth-roots, especially those of the first and second molar, reach al-

most to the periosteum of the antrum, and are separated from it by a very thin plate of bone, while in others even this thin plate is not present, and the roots lie in direct contact with the soft parts of the antrum. Caries of these teeth, therefore, leads easily to the periosteum, and not seldom to the formation of pus. Inflammation, therefore, can go directly to the mucous membrane of the antrum. Inasmuch, however, as almost all people have carious teeth, and as empyema of the antrum is comparatively seldom, this argument rather loses its force. It is perfectly possible that a carious condition can be present before the toothache appears. Even if after extraction of a tooth an empyema appears evident that previously has given no particular signs of its presence, nevertheless it is perfectly possible that the empyema could have lasted several years. The communication between the teeth and the antrum can have grown up, and this be reopened by the extraction of the tooth. I think that in many cases of chronic empyema this is just what happens.

Coming next to the other theory, namely, that the inflammation can pass from the nose directly to the antrum, I think that the majority of the present-day authors would rather hold to the preponderance of the nasal origin of antrum trouble.

The anatomist Zuckerkandl considered that antral empyemata of dental origin occurred very seldom. In his anatomy of the nose he speaks of the importance of the dehiscence of the infraorbital canal in the antrum, and states that in such cases the entire tract of the tooth nerves is in direct relationship with the antrum covering, and in case of disease of the sinus the mucous membrane can be pressed upon or infected. When this occurs, there would, of course, be pain, first referred to the tooth and supposed to be a toothache, especially if there should happen to be on that side a bad tooth. As a proof of his belief that the inflammation could pass directly (especially purulent inflammation) from the nose to the antrum, the following facts are cited:

First, the presence of cases of empyema that followed sound teeth.

Second, purulent inflammations of the sphenoid and frontal sinus.

Third, the presence of primary and inflammatory inflammation of the nasal mucous membrane.

Omochowski examined three hundred and four maxillary sinuses without seeing a single case of empyema of dental

origin, although he always chiselled away the maxillary process.

In thirty-nine upper jaws examined by Weichselbaum he found the first bicuspid carious in six cases, absent in eight cases, sound in twenty-five cases; second bicuspid, carious in ten cases, absent in seven cases, sound in twenty-two cases; first molar, carious in fourteen cases, absent in eleven cases, sound in fourteen cases; second molar, carious in nine cases, absent in nine cases, sound in twenty-one cases.

Krause considered that carious teeth did not bring about empyema.

Jeanty, in twenty-one cases where there were carious teeth, in connection with twenty-two cases of empyema, considered that in no case were the teeth the causative factor.

Moreau, in twenty-one cases of empyema, found only eight connected with caries of the teeth.

Killian reports forty cases of inflammation of the antrum—fifteen men, twenty-one women; with forty-four antral empyema—eighteen right, twenty-six left. Concerning the dental origin, the history of many was in doubt. Several thought the disease to have been due to ulceration of the teeth or brought about by tooth extraction. In several cases there was not the slightest complaint of the teeth. In four acute cases three had toothache; one with entirely sound teeth. Killian thinks the only way to get solution of the problem is not through the varying clinical observations, but through direct pathologic and anatomic examinations to find a direct way in which an inflammation can travel from the teeth to the mucous membrane of the antrum, by examination of properly prepared specimens as well as through bacteriologic work.

In four of Killian's patients, after extraction of the teeth there was direct communication with the antrum. In two there were only a very mucous membrane and a very thin bony layer between the tooth and the antrum. In this case it was the second bicuspid; in four it was the first molar, and in another the second molar.

As the observations seem to render probable the infection of the antrum from diseased teeth, one has also to think, in the case of inflammation from the teeth (especially in cases where the bottom layer or even the mucous membrane of the antrum touched the tooth), whether, as a matter of fact, an empyema must be produced. Killian doubts this, for an abscess at the root of the tooth can last a long time without breaking through

into the antrum. In such a case the mucous membrane itself can be pushed far forward, and it is also possible to imagine that the tooth can be extracted and the abscess wall opened without breaking through into the antrum. In the case of granulations or fungosity of the roots, as in the case seen by Killian, where the second bicuspid was carious with a hazelnut granulation on the root, this opened directly into the antrum, and after its extraction there was a correspondingly large communication between the alveolus and the antrum; nevertheless the washing out of the antrum gave no sign of any pus.

Finally, one must also consider the possibility that an inflammation of the nasal mucous membrane itself can be brought about as a result of the antrum empyema, the same way as by influenza. If the nose is absolutely sound; if influenza and the like can be ruled out, and where there is nothing to be considered except the diseased tooth, then it is more than probable from the clinical stand-point that the tooth was the cause.

Hajek, one of the principal workers at the present time in rhinology, thinks the presence of an alveolar sinus with a very thin lamella of bone over the tooth to be the principal cause of the origin of dental empyema. The infection of the antrum can be brought about by abscess of the tooth, inflammation of the pulp as the result of caries or from filling, purulent inflammation of the periosteum of the alveolar process, and cysts of the root with purulent contents. Oftentimes the empyema manifests itself through the extraction of a tooth because at the same time the antrum is opened and allows the pus to come out. In only thirteen cases out of approximately two hundred antrum cases that Hajek has seen in the last eight years, does he regard the origin of the same to have been due to dental cases.

Zuckerkindl and Dmochowski also advance the proposition that it is perfectly possible that many cases of empyema may be not the result of the tooth affection, but, on the contrary, that the tooth affection may be the result of carious and pathologic processes in the antrum itself, since the nerves and vessels of the antrum which supply a portion of the teeth have direct relations with the soft parts of the maxillary sinus, the deeper parts of the bone.

I have quoted thus somewhat freely from Strubell's article, interspersing it with comments of my own, because the subject is one of considerable importance, and I think these quotations show that any definite statement in the mass as to whether emp-

yemata are of dental or nasal origin is positively worthless. Each individual case must be worked out for itself, and it is in the working out of the individual case that I think the co-operation of the rhinologist and the dental surgeon is required. The dentist must not lose sight of the fact that many cases of empyema are of extra-dental origin; the rhinologist must not lose sight of the fact that not all cases of empyema are of nasal origin.

Coming from foreign to American authors, I think it will be found, on careful scanning of the latest literature, that the prevailing opinion among rhinologists is coming to be that the majority of cases are of nasal origin. In Cryer's book on the "Anatomy of the Face," he states, page 13: "This close proximity between the apical portions of the roots of the teeth and the sinus gives the impression that the maxillary sinus is oftener infected from diseased teeth than from any other source, some authorities claiming that three-fifths of the diseases of the antrum are brought about in that way. The writer thinks this is a mistake. Though recognizing that diseases of the antrum do arise from the teeth, he believes that, aside from constitutional diseases and malformations, it is more often through the common communication between the nasal chamber, the frontal sinuses, the ethmoidal cells, and the maxillary sinus that infection is conveyed to the antrum from diseased cells and sinuses above it. It is the writer's observation that there are more cases in which teeth are lost through diseases of the antrum than cases in which the teeth are primarily diseased, causing infection of the antrum and associated cells.

"Pus or infected matter will, of course, pass in the direction of the least resistance. When the investing tissues of a tooth become so infected, the osteogenetic layer of the muco-periosteum stimulates renewed activity, with the result that a new layer of bone is produced by it which covers these parts and protects this cavity so that abscesses, with but few exceptions, point and break into the mouth.

"Careless operation by the dentist sometimes causes infection of the sinus, as drilling through the tooth and the floor of the sinus, or forcing the root of a tooth into the sinus, through fracture of the wall in an unskillful effort to extract, or carelessness in driving artificial crowns or bridges upon the teeth or roots."

I have tabulated thirty-one cases of empyema of the antrum seen by me in private practice in the last eight years, with the

following results: Sixteen of them were chronic cases of undoubted nasal origin in connection with general ethmoiditis, with inflammation of the frontal sinus, or with atrophic rhinitis. One of these had syphilis, but the syphilis seemed to be a coincident condition rather than in any way the cause of the general ethmoiditis. Three were the result of influenza of nasal origin. One was traumatic, the result of a railroad injury. One was luetic, the syphilis causing a breaking down of the naso-antral wall on one side and a great thinning of it on the other. Six were of undoubted dental origin, while three were possibly of dental origin. Or, reduced to percentages, 64.6 per cent. were undoubtedly of nasal origin; 29 per cent. of possibly dental origin; 3.2 per cent. traumatic; 3.2 per cent. luetic.

It is extremely difficult in many cases where the empyema is a chronic condition and diseased teeth and general ethmoiditis are both present to determine which was the primary cause and which was a coincident or subsequent condition. Since carious teeth are very common in persons who do not have and never have had any nasal trouble, it is quite possible that the two processes can work along independently of one another. I think this probably occurred in one of the cases which I have stated to be of dental origin, and that really the nasal condition was the primary cause. In one of the cases which I have stated as distinctly of dental origin, this might reasonably be doubted, as no distinct trouble could be found with the tooth on its removal, and the dentist who removed it hardly considered that there was anything the matter with it. At the same time there was no general ethmoiditis, and the removal of the tooth relieved the condition of pain which was present in the antrum. On the whole, I think that in my analysis I have allowed quite as many of my cases to be of dental origin as the facts would warrant. In a recent article, "Pus in the Nose," (*Medical News*, December 24, 1904), I stated that I thought my experience had shown that approximately fifty per cent. of my cases were of dental origin, but a careful scrutiny of them shows this percentage to have been altogether too high. From twenty-five to thirty per cent. is probably much nearer the correct figure.

There are many cases of acute inflammation of the antrum of influenzal origin which are seen by every rhinologist, but of which no account is made here. In the three acute cases which I have tabulated pus was actually washed out of the antrum. The acute cases in which there were antral pain and

all the symptoms of acute non-purulent inflammation of the antrum I have disregarded.

So much, then, as to the origin of these affections. We come next to an equally important section of the subject: What shall be the treatment of the empyema of the antrum when the diagnosis is made? If we look up the history of cases reported even as late as five or six years ago, we will find that, preceding the days of more radical nasal surgery, the majority of these cases were all treated through openings through the alveolar process made by the extraction of the tooth, with an enlargement of the opening and its maintenance by means of a tube. In process of time a good many of them got well. Others, however, were condemned to wear the tube almost indefinitely. Tilley reports only five cases out of twenty-two that could give up the tube after having used it a long time. Of twenty-seven alveolar cases, fifteen had worn the tube with careful irrigation for at least six months. One patient had worn it ten years; another three and one-half years, and another two years.

I think we have now come to the point where this method of treatment in cases which have lasted any length of time must be considered as distinctly obsolete. Any one who has done a number of radical operations on the antrum, and has seen the character of the degenerated mucous membrane which is found there, often the entire antrum being filled with numerous polyps and various low formations of granulation tissue, will thoroughly appreciate the uselessness of expecting to get any cure through a small tube opening into the mouth, even though that tube may satisfactorily drain the pus. Again, why should a patient be compelled to syringe out his antrum, day in, day out, when a radical operation, the healing of which will be complete in a few weeks, can be performed and the case be disposed of once for all?

Without discussing further this subject of treatment as to its pros and cons, I will tell you the method which I am in the habit of pursuing and which I believe, in the light of our present knowledge, is the proper one. Given a case of supposed antral empyema, first, as to diagnosis. The presence or absence of pus can be determined pretty quickly and very easily by puncturing underneath the inferior turbinate as high up as possible and at the junction of its anterior and middle thirds, although there will be a few cases in which the antrum may be so filled with polypoid growth, with comparatively small secretion, that

the diagnosis here may for a short time be somewhat in doubt. In most instances, however, the diagnosis is definite enough.

In the second place, have the case examined carefully by a dentist to see if there is any trouble with the teeth. If the tooth is at fault, extract it. See whether it opens into the antrum. Assuming that it does and that the tooth is the causative factor, is the antrum acutely or chronically affected? If acutely affected, it will get well in a short time with daily washings out with the usual antiseptic fluids. If it lasts more than a reasonable time, two or three weeks, or even less, without manifest cessation, I regard the case as chronic, and further treatment by way of the teeth as useless. At the same time that the dentist was treating the teeth, if the patient was under my own observation, I should have enlarged the original exploratory opening made in the nasal wall of the antrum, by means of curettes and alligator cutting forceps, so as to get a free opening from the antrum into the nose, thus securing free drainage, which drainage is very much superior to that through the mouth. The short curettes, bent slightly on the shank, which are used for the radical mastoid operation and are of various sizes, and the smallest and second size Myle's alligator cutting forceps answer very well for this purpose. If the case lasted any considerable length of time, I should next do a radical operation, taking off, under ether, sufficient of the front wall of the canine fossa, so that free inspection of the antrum cavity could be had; its entire contents, including the mucous membrane, removed if necessary, and a large counter-opening then made directly into the nose underneath the anterior end of the inferior turbinate; the natural opening also enlarged, and the whole antrum cavity packed with gauze. The canine fossa opening is allowed to close in a few days, thus sealing off the cavity of the mouth, and the nasal opening is retained as the permanent one. The details of this operation I have described in my book on the nose and throat* and in the article already referred to in the *Medical News*.

This operation, of course, lies in the province of the rhinologist rather than of the dentist, but the entire working out of the pathology and treatment in the borderland cases should be made by the dentist and the rhinologist together.

There is another class of antrum cases which might have been considered in our discussion of the etiology—namely, those in

*Nose and Throat Work for the General Practitioner, N. Y., 1903.

which the antrum is infected from the frontal sinus by reason of the drainage of the pus from frontal sinus empyemata, down through the infundibulum, and then into the natural opening of the antrum, or directly into the antrum, a condition which occurs, and so frequently that I now believe that all cases of radical operation of the frontal sinus should have at the time of operation, or previously, exploratory puncture of the antrum to determine whether or not the antrum is at the same time affected.

The after-treatment of the cases in which a radical operation is done is comparatively simple, does not last a great while, and has in my hands been invariably successful.

REPORT OF 31 CASES EMPYEMA ANTRUM.

Name.	Sinus involved.	Operation.	Date first seen.	Date last seen.	Result.	Remarks.	Origin.
Mr. F. W. N.	22 R. frontal, R. antrum.	Right frontal operated on by external incision. Antrum washed out.	Nov. 4, 1898.	Jan. 7, 1901.	Cured so far as known.	Antrum was originally free from pus; became infected from frontal.	Nasal.
Miss M. B.	25 R. antrum.	Exploratory puncture underneath inferior turbinate. Daily washings.	Sept. 25, 1896.	May 11, 1897.	Cured so far as known.	Had atrophic rhinitis also.	Nasal.
Mr. D. H. C.	66 R. antrum.	Exploratory puncture under inferior turbinate. Silver canula daily washing.	Oct. 3, 1896.	Mar. 14, 1898.	Cured so far as known.	In apparently good health.	Nasal.
Mr. W. H.	32 R. antrum.	Nov. 4, 1892, puncture of antrum showed pus. Daily washing without effect. Dec. 15, 1902, radical operation through canine fossa with extraction of first molar tooth.	Apr. 11, 1898.	May 28, 1903.	Cured.	First molar tooth penetrated floor of antrum and had a pus pocket attached. Antrum walls not specially diseased.	Dental.
Mrs. S.	64 L. antrum.	Exploratory puncture; daily washings for two months. Improved, but no cure. Then removed second molar and made large incisions through the alveolar process. Cured in few days.	Feb. 5, 1897.	May 3, 1897.	Cured.	Complained at no time of tooth which was filled with amalgam.	Dental.
Miss J. S.	24 R. antrum.	Puncture underneath the inferior turbinate and washed out cavity.	June 17, 1899.	Dec. 9, 1899.	Slight discharge at time case lost sight of.	No trouble with teeth. Antrum very small.	Nasal.
Mr. G. D. F.	26 R. antrum, and R. frontal.	Washed out antrum to no purpose; then did radical antrum and radical frontal.	June 21, 1899.	April 6, 1904.	Cured.	Case traumatic in origin from railroad accident.	Traumatic.
Mrs. M. G.	37 Both frontals, Both antra.	Various operations on frontal sinuses; antra secondarily infected from these.	Oct. 17, 1899.	July 12, 1904.	Cured.	Extensive ethmoiditis several years duration.	Nasal.

Mrs. F.	41 L. antrum.	Radical from antrum through canine fossa, syringing having failed to effect a cure.	Dec. 13, 1899. Then occasionally to April 11, 1904, when radical operation was done.	Oct. 28, 1904.	Cured.	Originally thought was case atrophic rhinitis simply. Pain from pressure on infraorbital nerve a prominent after-symptom. Disappeared in three weeks.	Nasal.
Mr. M. S.	24 L. antrum.	March 7, 1900, radical through canine fossa. Antrum filled with soft, pulpy granulation tissue. Second bicuspids absent.	Mar. 2, 1900.	Sept. 1904. Antrum clear.	Cured as to antrum by first operation.	Frontal was afterwards operated on and again three years later. Permanent cure now effected.	Nasal.
Mrs. N. A.	25 R. antrum.	Radical through canine fossa and also through alveolar process at site first bicuspids previously removed.	June 9, 1900.	Aug. 4, 1900.	Cured.	First molar absent at time of operation.	Nasal or dental (probably dental).
Mrs. A. C.	30 L. antrum.	Radical through canine fossa and also through alveolar process at site first bicuspids previously removed.	June 12, 1900.	Nov. 4, 1902.	Cured.	Wore gold tube through alveolar opening for awhile as no opening was made into nose. It would have been better to have made one.	Nasal.
Miss M. D.	29 L. antrum	Exploratory puncture.	April 5, 1902	Under treatment for atrophic rhinitis, but antrum has no pus.	April 16, 1903.		
Miss A. A.	24 L. antrum.	Exploratory puncture.	Oct. 23, 1902.		Cured.		Nasal.
Miss H. D.	26 Both antra. Had general ethmoiditis with polyp formation.	Radical both antra.	April, 1901. Nov. 21, 1902.	Sept. 3, 1904.	Cured.	At time of operation three carious roots were found penetrating nasal, left antrum. As both antra were diseased and no trouble with teeth on right side, doubtful if tooth was cause.	Probably nasal, perhaps dental.
Miss O. M.	17 R. antrum.	Radical operation frontal sinus and antrum.	Feb. 11, 1902.	June 9, 1903.	Cured.	Operated on frontal first, then did radical antrum as pus discharge did not stop. Think frontal infected antrum.	Nasal.

Mr. W. G.	20 R. antrum, R. frontal.	Radical for each	Mar. 27, 1903.	Dec. 14, 1904.	Apparent-ly cured.	Impossible to say whether frontal or antrum primary source of trouble. Had general ethmoiditis.	Nasal.
Dr. G. L. R.	40 L. antrum.	Exploratory puncture. Daily washing.	Jan., 1903.	Three weeks duration. Mar. 12, 1903.	Cured.	Absolute cure in three to four weeks.	Nasal (influenza).
Mr. A. J. P.	25 R. antrum.	Exploratory puncture.	Mar. 10, 1903.	Mar. 12, 1903.	Cured.	Acute case influenzal origin.	Nasal.
Mr. E. P.	21 Both antra.	Exploratory puncture L. Right side naso antral wall already perforated.	June 27, 1903.	Nov. 7, 1903.	Improved.	Result tertiary Lues.	Luetic.
Mr. L. W. J.	24 Both antra. Both frontals.	Radical operation all four cavities June 17, 1903. All sinuses filled with polyptane and degenerated mucous membrane.	Dec. 1903.	Dec. 1904.	Cured apparently.	No tooth complications.	Nasal.
Mr. M. W. M.	25 L. antrum, L. frontal.	Exploratory puncture antrum showed pus. Frontal sinus also involved.	Oct. 21, 1903.	Nov. 24, 1903.	Relieved.	Middle turbinate was removed. This improved drainage. No other treatment allowed.	Nasal.
Mr. H. S. H.	35 R. antrum.	Radical operation R. antrum.	Feb. 10, 1903.	Dec. 22, 1903.	Cured.	Luetic with general ethmoiditis and polyp each nostril. No tooth symptoms.	Nasal. Luetic.
Miss G. A.	49 L. antrum.	Removed portion middle turbinate followed by radical antrum operation.	April 21, 1903.	July 14, 1903.	Cured.	Had first molar tooth pulled but root found to be healthy and not penetrating antrum.	Nasal.
Mrs. W. W.	68 R. antrum.	Exploratory puncture daily washings; removal middle turbinate.	Nov. 19, 1903.	Dec. 12, 1903.	Improved.	Had many nasal polypi and extensive ethmoiditis. On account of very poor general health no further operation allowed.	Nasal.
Miss M. T.	32 L. antrum.	Exploratory puncture and daily washing out with canula.	March 5, 1904.	March 19, 1904.	Cured.	Acute case from influenza. No return eight months later.	Nasal.
Miss F. H.	36 R. antrum.	Second bicuspid extracted; showed old inflammation at root but did not penetrate the antrum. Then drilled into antrum. This opening closed in two days. The exploratory opening from the nose then enlarged with curettes and cutting forceps.	May 24, 1904.	Sept. 3, 1904.	Cured.	This may have been primarily of dental origin as pus had lasted some time. After establishing free nasal drainage cure was rapid.	Nasal or dental.

Mrs. N. B. B.	50 R. antrum.	Removed first molar; showed root abscess with opening directly into the antrum.	April 18, 1904.	May 20, 1904.	Cured	After treatment through root cavity only.	Dental.
Mrs. D. V. C.	30 R. antrum.	Exploratory puncture through nose. Second bicuspids, a capped tooth, then removed. No abscess, but penetrated antrum.	April 2, 1904.	April 15, 1904.	Cured	Influenza closed natural opening. Pus probably of dental origin, but gave no sign. Many patients do not notice slight purulent discharge, considering it a symptom of what they call catarrh.	Dental.
Mr. W. E. Y.	37 R. antrum.	Exploratory puncture under inferior turbinate. Removed second bicuspids. No apparent connection with antrum but relieved pain. Cut away portion nasal antral wall with cutting forceps. Cut away na-o-antra wall under each inferior turbinate.	April 23, 1904.	Sept. 10, 1904.	Cured.	Had complained of catarrh for some time with some discharge.	Possible dental. No ethmoidal trouble.
Miss H. C.	23 Both antra.		Dec., 1904.	Feb., 1905.	Apparently cured.	Had extensive ethmoiditis and polypi. Removed anterior end each middle turb. All 4 teeth sound.	Nasal.

XI.

MY RESULTS FROM THE TREATMENT OF VERTIGO, TINNITUS AND DEAFNESS BY BABINSKI'S METHOD.

BY DR. TRETROP,

CHIEF OF THE CLINIC, ANTWERP HOSPITAL.

Shortly after Babinski's communication upon the treatment of ear affections and especially of auricular vertigo by rachicentesis², last February, I began a systematic study, both in my private practice and in my hospital clinic, of cases to which the method was logically and scientifically applicable, and it is the result of this personal clinical study which I desire to give you to-day.

But before doing this, it will not be out of place to sum up in a few lines the origin of this method and what it has yielded at the hands of its author.

The idea of applying rachicentesis to the treatment of functional diseases of the ear was with Babinski, as he said himself, the result of a syllogism. In the course of a physiologic study of voltaic vertigo Babinski was led to inquire into the vertigo of pathologic cases.

If the electrodes of a continuous current of a few milliamperes are applied to the temples or mastoid processes in a normal subject, the passage of the current causes vertigo, nausea and nystagmus. Moreover, the head inclines toward the positive pole side.

Physiologists were not agreed as to the mechanism of this action of the current. To elucidate the matter Babinski had recourse to what occurred in patients with ear disease, and he found in a general way "in unilateral lesions the inclination usually predominates toward the diseased side, or even does not take place except upon this side, whatever the direction of the current."

(1) Communication to the Annual Meeting of Belgian Specialists, Brussels, June, 1904.

(2) Babinski—*Annales des Maladies de l'Oreille*, February, 1904.

Knowing, furthermore, that hysterical deafness does not give this reaction, our distinguished confrere concluded that voltaic vertigo was occasioned by excitation of the labyrinth, which, as we know, is not involved in deafness of hysterical origin.

In patients with normal ears, submitted to rachicentesis for cytologic diagnosis, Babinski found that resistance to voltaic vertigo was diminished after the operation, and he then made the following syllogism:

(a) Voltaic vertigo has its origin in excitation of the labyrinth.

(b) Rachicentesis affects voltaic vertigo.

(c) Therefore rachicentesis affects the labyrinth.

The method utilized is that familiar to you as generally applied for cytodiagnosis or rachicocainization.

Rigid asepsis of the region, the instruments, and the hands of the operators is necessary.

The quantity of fluid withdrawn at first was 4 to 6 cubic centimeters; later it was increased to 15 or 20 cubic centimeters.

I punctured all patients in the lateral decubitus, after anesthesia of the skin with the coryleur, and did either a Quincke or Chipault puncture, indifferently. Punctures were made upon 15 persons, some of whom were punctured several times.

The quantity of fluid withdrawn at one time varied from 6 to 18 cubic centimeters. During the puncture, aside from a few frightened patients with a syncopal tendency, I have not observed anything special. The pain is almost nil; it is only felt at the moment of penetrating the skin and when the needle is withdrawn. Under ethyl chlorid many persons do not even feel it.

The functional results have been encouraging. The vertigo was regularly influenced and generally disappeared completely.

The tinnitus followed a similar course and, taking my statistics at present, I would be tempted to say that it has almost disappeared like the vertigo.

As to the deafness, in three cases I obtained without any doubt an unexpected result.

I submit herewith some illustrative cases with their acoumetric tables.

Millimetric Auditory Scale of V. Julienne.
(Measured by Dr. Tretop's Acoumeter.)

	Mar. 8, 1904.	(1) Apr. 14, 1904.	(2) Apr. 25, 1904.	Notes.
Right Ear				
Watch	—	—	—	(1) Eight days after the first puncture.
Fork	—	5	35	
Music	—	—	—	(2) Ten days after the second.
Voice	—	—	—	
Left Ear				
Watch	83	—	—	Hears loud voice, at 40 centimeters.
Fork	181	—	—	
Music	124	—	—	
Voice	95	—	—	

Millimetric Auditory Scale of B. Marie.
(Measured by Dr. Tretop's Acoumeter.)

	Mar. 8, 1904.	May 17, 1904.	May 31, 1904	Notes.
Right Ear				
Watch	—	—	—	Marked deafness for 3 years.
Fork	0	52	57	
Music	—	—	—	Hears loud voice at 50 centimeters.
Voice	—	—	—	
Left Ear				
Watch	—	—	—	
Fork	40	46	49	
Music	—	—	—	
Voice	—	—	—	

Millimetric Auditory Scale of G. Marie.
(Taken with Dr. Tretop's Acoumeter.)

	(1) Feb. 25, 1904.	(2) May 31, 1904.	Notes.
Right Ear			
Watch	—	—	(1) Before puncture.
Fork	—	39	
Music	—	—	(2) After puncture.
Voice	—	—	
Left Ear			
Watch	52	88	
Fork	75	168	
Music	21	78	
Voice	15	68	

The acoumetry, taken before puncture and after with the aid of the millimetric acoumeter which I exhibited to you in 1902, leaves no doubt as to the considerable improvement in hearing.

Case I. V. Julianne, aged 16 years, total right deafness for three years, accompanied by vertigo and vomiting. Headaches frequent.

October 14, 1903, when I saw her first, I found that not only was air conduction abolished on the right side, but bone conduction likewise. The fork applied to the mastoid was not heard.

After persevering and continuous treatment the cranio-tympanic conduction reappeared slightly, but this was all I could obtain.

At the beginning of April, I withdrew by rachicentesis about 7 cubic centimeters of fluid in previously measured sterile tubes. A few days later the patient heard loud voice on the affected side at 20 centimeters, the good ear being hermetically closed.

About the middle of April I made another lumbar puncture. Under pressure the fluid made a jet 8 to 10 centimeters long. I took away about 10 cubic centimeters of very clear fluid.

The postoperative headache was less than before and the hearing again increased to 40 centimeters for loud voice.

Herewith is a table of this patient's hearing distances before and after the operation. The result of the treatment is free from suggestion or simulation.

Case II. B. Marie, 27 years, formerly adenoidal, attacked with deafness for fifteen years with tinnitus and vertigo. Previously treated unsuccessfully. I withdrew by lumbar puncture about 16 cubic centimeters of very clear fluid.

Three days later the vertigo disappeared, the tinnitus also; there remained, said the patient, a slight humming. The patient claimed to have considerable relief in her entire head.

As to the deafness, it is so much improved that all her companions have remarked that she hears conversation better than ever before, even by approaching very near and inclining her ear. She voluntarily states that she has not heard for fifteen years as well as she does now.

Herewith is her acoumetric table which clearly shows the progress attained. It is to be noted that I had previously treated this patient by the usual methods, without the slightest success.

Case III. G. Marie, 20 years, attacked over a year ago with total right deafness, accompanied by nausea, vertigo

and vomiting, against which all treatment was, if not wholly a failure, at least very slightly effective.

I withdrew by lumbar puncture about 15 cubic centimeters of cephalo-rachidian fluid. The patient was considerably affected for a few days; she was obliged to stay recumbent; there was loss of appetite, intense headache and insomnia; the attacks of vomiting did not stop during the first week. Then everything improved and the patient, who heard absolutely nothing before on the right side, was able to hear loud voice. She voluntarily testified to a manifest improvement in her hearing. The considerably impaired hearing on the left side was also markedly increased.

The acoumetric table attached, giving exact measures before and after operation, shows the increase obtained.

Case IV. Although lumbar puncture failed, this case deserves to be related briefly because of its clinical rarity.

A young sailor, robustly built, was attacked with total deafness in the course of typhoid fever. The deafness coincided with the administration of an ordinary dose of quinin.

Investigations which I have made into the ears of subjects dead of typhoid, have frequently revealed intense congestion of the whole organ and especially of the labyrinth. Hemorrhagic exudates into the tympanum are not rare. Did the quinin, which has been accused of producing congestion of the labyrinth but is now believed to decongest the internal ear, have any effect here? It is a difficult question to answer. No lesions of the tympanic cavities could be determined, but there was marked pallor of the entire membrane, notable in the region of the hammer handle.

Although there were no symptoms of labyrinthine irritation but rather of a deep lesion, after various unsuccessful treatments I believed that I was justified in trying rachicentesis on the patient, who had become incapable of taking up his work and earning a livelihood.

The first puncture, at the beginning of April, yielded 12 cubic centimeters of very clear cerebro-spinal fluid which came out under pressure. The results were nil; no headache but no improvement. I punctured him again later, taking away about 18 cubic centimeters of fluid. The patient reacted more than before but he remained absolutely deaf both by air and bone conduction. It is therefore to be feared that the labyrinth is permanently impaired.

Case V. This history clearly proves what may be ob-

tained by lumbar punctures in cases of inveterate vertigo and tinnitus, dating back for years and treated without much improvement by other methods.

This was a police officer whom I presented last May before the Antwerp Medical Society. He was in good general condition, aged 50 years, in service 27 years, and was attached three years ago with vertigo, tinnitus and deafness. He had undergone treatment by non-specialists without success and though I had temporarily improved his condition in my care of him for a year, I had not removed his annoying symptoms. Nausea was not rare, Romberg's sign was clearly marked. During the latter months the symptoms were so aggravated that at times the patient found himself unable to perform his duties.

I did lumbar puncture and withdrew only 8 cubic centimeters of fluid which oozed out drop by drop. At the fifth centimeter he had a sensation of fainting.

The puncture was followed by pain in the neck and back which obliged him to lie abed for several days. Then his head became easy, the vertigo and tinnitus disappeared completely. The deafness has changed very little, it has rather slightly improved. There is also in this patient a progressive atresia of the auditory canals, especially the left.

As the patient himself declared to the Antwerp Society, he feels totally different since the operation. He is extremely happy at the complete change in his condition, and he has again taken up his work with a satisfaction which he has not had for three years.

I have punctured cases of syphilitic labyrinthitis and deaf-mutism without observing any results up to the present which merit reporting. Many of them are too recent, and, furthermore, Babinski reports only one striking success out of 106 cases.

From the viewpoint of deafness, I have had a fortunate series, possibly in part because of specially chosen patients. Babinski claims 13 per cent of improved hearing in 106 cases. Personally, I have 3 cases in 15, or 20 per cent, but my series is too small to establish a percentage.

To sum up the Babinski method of treatment according to the data of the author and my own personal experience, I would say:

1. In cases of labyrinthism, accompanied or not by lesions of other parts of the auditory organ, when other

treatment has no effect, we are justified in proposing lumbar puncture while telling the patient that is not a panacea, but a method that gives a percentage of cures and also failures.

2. The attacks of vertigo which are often so annoying are the most favorably influenced, then comes the tinnitus, and lastly the deafness.

It is proper to say here, parenthetically, that the persevering and judicious use of Delstanche's *masseur-rarefier*, by decompressing the labyrinthine liquid, may in similar cases yield unexpected results, as I have myself observed in some cases where the symptoms made existence a burden. But its use by the patient himself must be discouraged, as he will employ it indiscriminately and only do harm.

2. Deaf-mutism appears to me amenable to this method. It has a better chance of success if a careful examination shows that some internal ear perception still exists and that the latter can be developed by appropriate medico-educative treatment. The method can be advised only as a chance of cure, without promising anything.

In both classes of cases—pure labyrinthine affections and those complicated with deaf-mutism—careful examination, noting the lesions and measuring the hearing power, is necessary before operation if errors would be avoided.

Pure labyrinthine affections are most effectively influenced.

What are the dangers in or contra-indications to rachicentesis? Babinski tells us: "Rachicentesis, being without danger and not exposing patients who undergo it to any aggravation, should be attempted, unless specially contraindicated, in all persons having aural trouble which are refractory to the various methods of local treatment."

This conclusion is very broad, and perhaps exceeds the intent of its author. Taken literally, since it is not stated how soon the local treatment may be considered ineffective, puncture would be done upon a great number of patients.

The contra-indications to lumbar puncture have been too thoroughly set forth to speak of them again here. So far as the mind is concerned, a question which was raised by parents of my child patients, there is no reason to have the least fear. In Babinski's cases where mental troubles co-existed the mind was regularly improved.

For safety it would be well, in doubtful cases, not to do lumbar puncture without assistance. In fact it is quite

convenient to have a practitioner watch the pulse and respiration while the operator, relieved of this care, proceeds to do the puncture and take away the fluid.

Personally, aside from the more or less prolonged headache, occasionally rather persistent nausea and vomiting, well known symptoms, sometimes suggesting meningitis by their intensity, but always disappearing, I have not observed anything special. I performed puncture with my patients reclining and the skin anesthetised by the coryleur. The pain, even in children, was nil, one might say. As to operative sequelae, with rigid asepsis of hands, instruments and the operative field, I have had none. To dress the wound and prevent infection, iodoformized collodion and a little wisp of sterile cotton are excellent.

Otology is about to be enriched, then, with a new procedure which in certain definite cases may cause vertigo and tinnitus to disappear and sometimes even to improve deafness materially.

XII.

LUMBAR PUNCTURE AND AFFECTIONS OF THE EAR.¹

BY E. LOMBARD,

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In this paper we desire to make known the results which we have obtained in certain ear affections, such as dry adhesive otitis with deafness, tinnitus and vertigo, by lumbar puncture, after Babinski's method, and the conclusions which they suggest to us.

For this therapeutic study we were careful to choose from the hospital clinic cases which were as clearly defined as possible. It adds interest, we think, in order to estimate the therapeutic value of this method, to address ourselves to cases in which purely otologic treatment is incapable of giving results.

It is common to see tubo-tympanic catarrhs, untreated or insufficiently treated, accompanied, beside deafness, with tinnitus and vertigo: symptoms which disappear after inflation of air through the Eustachian tube or by methodical bougieing of the tube. We have also, in the course of our research, met with several cases where rachicentesis had been proposed, but which were easily cured by the above means.

On the other hand, it is not rare to see cases of deafness where the lesions are mixed, and where to the usual lesions rule where the catarrhal element intervenes, may pervert

(1) Communication to the Seventh International Congress of Otolaryngology, Bordeaux, August 1-4, 1904.

From *Annales des Maladies de l'Oreille, du Larynx, du Nez et du Pharynx*, December, 1904.

of otitis sicca are added catarrhal lesions of the tympanic mucosa. With the variability of symptoms, which influences the interpretation of results, we have also eliminated this class of cases.

Chance and the rarity of the affection have prevented us from finding cases of deafness and vertigo where, without middle ear lesions demonstrable objectively or by hearing tests, the labyrinth alone appears to be at fault (pure nerve deafness); so we have confined ourselves to dry otitis with or without labyrinth insufficiency. But here again we have tried to pick out cases clearly diagnosticable, and to establish the seat and degree of the lesion. If this manner of procedure has somewhat restricted our field of experiment and resulted in a perhaps fastidious extent of observation, we hope nevertheless to have performed useful work, for only precise observation permits comparison and exact appreciation of the results obtained by different authors.

For the various tests which we have made we have constantly employed the same instruments:

A fork of which the average duration of air and bone perception, for us, is 60 seconds (air) and 30 seconds (bone). The values obtained are of course only relative to our own hearing.

A watch which, by a large number of subjects with apparently normal hearing and in the room where we work, is heard at over five meters.

Finally, for hearing tests with loud or whispered voice, we have never employed phrases where the possibility of guessing was too great, but only words, always the same, made up mostly of consonants (tambour, tampon, bonbon, planche, tranche, manchon, bouchon, etc.), so as to make the results comparable.

Case I. Otitis sicca. Immobility of the first ossicles. Tinnitus. Vertigo. Subjective improvement, immediate but not permanent, of the tinnitus.

Mme. Sch——, forty-five years, deafness, tinnitus and vertigo. The deafness and tinnitus dated back ten years; the vertigo since September or October, 1903.

The deafness came on gradually; she did not notice it; her companions noted that she often made them repeat. The deafness was less noticeable out of doors in the noise.

The tinnitus came on at the same time as the deafness, at first not severe and occurring alternately in each ear.

It now exists (Feb. 12, 1904) in both ears, very intense, night and day. It is less severe in the left ear. Does not prevent sleep. Accompanied with bilateral frontal headache.

The vertigo occurs, at the maximum, three times a week, often once or twice a week; when it comes on (usually in the morning) everything appears to turn around, and she is obliged to sit down or support herself by some object, but there is never any falling. At the same time the tinnitus becomes more intense.

All causes producing congestion of the head, heat, reading, attention, increase the tinnitus.

Her husband had had pulmonary tuberculosis and syphilis but the patient appears not to have been infected. No abortions; five children died in convulsions at six weeks, two months and two years, the eldest aged twenty-two years. These children were all healthy at birth and without trace of syphilis.

The patient is rather corpulent, face red and full; the cheeks show varicosities like those of heart trouble (no cardiac lesion). Very nervous, no pharyngeal reflex; no very characteristic stigmata of hysteria.

The tympani on both sides are a little opaque. The mallei have normal position and inclination, but are completely immobile.

The tubes are permeable.

The hearing-tests gave the following results:

	Right Ear.		Left Ear.	
	Before Politzer	After Politzer.	Before Politzer.	After Politzer
Watch, air	0	0	0	0
Watch, bone	0	0	0	0
Voice	Shouted, 0	0	Very loud, at contact	0
Whisper	0	0	0	0
Fork, air	0	0	10"	0
Fork, bone	12", 14"	8", 10"	4", 15"	0
Weber			Positive	
Paracusis	Negative		Negative	
Romberg	0	0	0	0
Galton	At the 12 mark is scarcely heard; below this not at all.		At the 12 mark = 2.50 m.; at 10 = 50 m.; below this scarcely heard.	

Siegel. Malleus immobile, right and left.

Tubes. Very permeable.

February 13, 1904, first lumbar puncture. Claimed before puncture to have intense headache, and great tinnitus; had vertigo coming to the hospital.

Ten cubic centimeters of cerebro-spinal fluid were removed, escaping under pressure. At the 6th centimeter she claimed that her head was eased and that the right tinnitus was less. The puncture finished, she declared that she heard no more tinnitus, none at all on the right, the same on the left. The fork by bone shows no change on the left, but the mean duration is 30" on the right. We say mean, for the duration varies considerably in successive examinations: it appears to diminish with the repetition of the tests. Further, as we have verified in a number of patients, it also varies with the point of application of the fork, the maximum occurring when the stem is over the antral region, the minimum at the tip, and an intermediate duration over the temporal region.

February 14, 1904. Hearing no better. The tinnitus has reappeared: however, it is less intense.

February 15, 1904. In the afternoon had been able to speak from her bed with her neighbors, distant about 3 meters, without them having to raise their voice. But we do not rely upon this so-called amelioration: same values for watch, loud and low voice.

February 16. Tinnitus just as severe as before puncture. She rises and walks without vertigo. When, seated upon her bed, she wishes to lie down, "her head appears to be drawn back as if its weight were enormous." No improvement of hearing for voice: however, we note an improvement for the fork by air (12" right and left) and also by bone, but the differing measures and important variations oblige us to strike an average.

February 17. Appearance of the menses.

February 18. The patient says that while not understanding loud voice she hears the sound more clearly in conversation.

The improvement is most manifest in the right ear in which tinnitus is now almost imperceptible. The heaviness of the head has diminished. The tests with the fork by air and bone show the same as before.

In the course of the fork test, we note that the moment the stem applied to the left mastoid ceases to be heard and is taken away, the patient declares that this side is now free and the tinnitus reappears on the right.

February 25. The menses having ceased, another lumbar puncture was done, 15 cubic centimeters being taken, this time with much less pressure. About the 8th cubic centimeter, the tinnitus of the left ear, which had persisted until now, becomes less. "I still hear the bells but not the choo choo." On this same side is noted better audition for words, which are heard (loud voice) at 10 centimeters. Fork, air 14, bone 28.

February 29. The tinnitus in the left ear has returned very strong. In the morning at the bath had vertigo. Words are heard (loud voice at 5 centimeters only). Whispered voice and conversation are not heard.

At the moment when the fork applied to the left mastoid is not heard and is removed, the patient again declares that the tinnitus disappears on the left and is transferred to the right. The right tinnitus having ceased about midday, the left tinnitus recurred with the same intensity. Further, there is not a total disappearance of the left tinnitus but a diminution of intensity.

To sum up, conversation is not heard any better; words spoken with loud voice appear to be heard a little better on the right, but, as the same words usually recur, it must be taken into account that the patient may guess them rather than comprehend. The tinnitus is a little less on the right, not much better on the left. As to the vertigo, it does not appear to have been affected by the treatment, since it has recurred four days after the last puncture.

Revisit, July 29, 1904. No improvement. The tinnitus is constantly severe and there is occasional vertigo. The deafness has increased.

Case II. Otitis Sicca—Immobility of the first ossicles. Labyrinth insufficiency. Deafness. Vertigo. Tinnitus. No improvement.

Louis C., 62 years, deafness, vertigo and tinnitus (service of Dr. Sebileau).

Deafness existed upon both sides. On the right it dated back to the age of six years; he had had otorrhea, vestiges of which remained upon the tympanum. On the left the deafness had begun ten years ago and had come on suddenly. He had taken cold in the head (?), and the following day he was deaf, as deaf as now; the deafness had not increased. He did not recall being hard of hearing before that. The tinnitus appeared almost immediately after.

The tinnitus is extremely intense, sometimes simulating

the noise of a piston, sometimes that of a waterfall. It exists upon both sides.

The patient claims to be in an almost constant vertiginous state. There is particularly a sensation of emptiness of the head; but there is sometimes a severe vertigo which obliges him to seize something to prevent falling; this is accompanied with vomiting. He had had no vertigo before his deafness which he attributed to a worm and which persisted after the disappearance of the latter.

The deafness is pronounced, as may be seen by the following table. It becomes complete in noisy places.

	Right Ear.		Left Ear	
	Before Politzer.	After Politzer.	Before Politzer	After Politzer.
Watch, air	0	0	Contact (barely)	Contact (barely)
Watch, bone	0	0	0	0
Voice	0 (even shouted)	0	.50m .55m	.50m .55
Whisper	0	0	0	0
Fork, air	0	0	Slightly	0
Fork, bone	0	0	6"	6"
Weber			Left	
Galton	The highest sound is not heard. The lowest is heard at contact.		High and low sounds heard only at contact.	

Tubes. Permeable, especially the right.

Examination of the tympani shows:

On the right, in the postero-superior quadrant, a cicatrix in the drum, probably from an old otorrhea. All the antero-inferior quadrant is greatly thickened. The hammer is completely immobile.

On the left, the hammer is also immobile, and the membrane shows sclerosis with thinning. Calcareous degeneration at the center; thinning of portions of the posterior-inferior quadrant. The patient is a man of medium height, strong, very stout, has chronic bronchitis, with emphysema, rather pale, having always been subject to vertigo.

No syphilis. Pulse strong, rather tense, without cardiac lesion. Urine normal. Reflexes normal.

We may add that recently he decided to have his ears looked after. For eight months he has been treated by insufflation of air into the Eustachian tube. He had obtained an improvement of hearing (?) but not of the tinnitus.

June 20, 1904. First lumbar puncture. Fifteen cubic centimeters of fluid withdrawn which came out under strong pressure.

During the days following, no improvement, either of the hearing or tinnitus was noted. He had a slight mitigation of the vertiginous sensation, which he continually felt, but he claimed to have headache which he localized at various points, notably the occiput. No change in hearing tests.

July 4. Another puncture of 15 cubic centimeters, which escaped this time with little pressure. No more change than the first time.

July 13. Another puncture of 15 cubic centimeters. The fluid came out drop by drop, very slowly. No more success than the other two times.

To sum up, no change in the deafness, the tinnitus or even the vertigo, which latterly has reappeared in its light form. He continually complains of headache in different spots, which he did not have before the puncture.

Went out July 22, 1904.

Case III. Deafness. Vertigo. Tinnitus. Probable ankylosis of the stapes. Lumbar puncture. Subjective and objective amelioration of the vertigo. Apparent improvement of the hearing, not confirmed by tests.

Mme. G., 54 years, came Dec. 7, 1903, to Dr. Sebileau's clinic at Lariboisiere because of deafness, tinnitus and vertigo.

She had been completely deaf for two years, but for several years she had been treated for deafness. Since September she had had vertigo. At that time she was attacked one morning while walking with a violent vertigo, faintness and loss of consciousness: since then she has only once had vertigo with loss of consciousness. Sometimes she has vertigo twice a day, especially of mornings, on rising, and when she stoops. There is first tinnitus, then vertigo with nausea and faintness either before or after, without loss of consciousness.

When we saw her, December 7, 1903, the vertigo was somewhat lessened under the influence of potassium iodid, which was prescribed by her physician.

The hearing tests indicated a double lesion of the middle ear, with mobility of the malleus, but total impermeability of the Eustachian tube to insufflation. The introduction of the bougie is possible on both sides, but even after bougieing the air does not always pass.

She entered the hospital May 8, 1904. She has tinnitus, but (as at her previous visit) she declares that it is intermittent, ceasing sometimes only to reappear within eight hours; it has a preference for coming on after eating or in the night, or of mornings on waking.

The vertigo has diminished somewhat since the last examination. It occurs particularly of mornings, never while at rest, but during movements, when she suddenly raises her head. At night if she lies upon her left side or her back the vertigo appears, everything swims and she seems to lose consciousness. If during sleep she unknowingly turns upon her left side the vertigo appears and awakens her.

If she is made to turn her head quickly the vertigo comes on, with palpitation of the heart and nausea. No Romberg sign.

Never ill, she says; she suffers some with her stomach, however, and the heavy feeling in her stomach, which coincides with the vertigo, she attributes to the medicines which she has taken.

She has well-defined vaso-motor trouble; at the least emotion or if she does not comprehend a question her face becomes very red at once. Never had syphilis; no children and no miscarriages.

Father died at 39 as the result of exposure; mother died at 45. Neither was deaf nor were her two healthy sisters.

The heart shows nothing abnormal on auscultation. The pulse rate is 80, somewhat tense. The other viscera show nothing abnormal. No sensory troubles nor of the reflexes. Urine normal.

The tympani on both sides are slightly retracted, rather dull and thinned. The mallei are mobile. Normal sensi-

	Right Ear.		Left Ear.	
	Before Politzer	After Politzer.	Before Politzer	After Politzer
Watch, air	.01	No modification.	0	No modification.
Watch, bone	0		0, even on contact	
Voice	.02		Barely, even on contact	
Whisper	0		0	
Fork, air	12"		12"	
Fork, bone	30" 35"		25" 27"	
Weber	?			
Gelle	No change		No change	
Paracusis	Positive		Positive	

tiveness of the canal and membrane. Absolute impermeability of the tube.

May, 1904. Lumbar puncture; 12 cubic centimeters of clear liquid under pressure. The immediate result is a headache, lasting until evening. During the next few days she feels a little easier; she can recline upon her back without having vertigo. The tinnitus, when it occurs is much less intense.

May 17. Another puncture; 13 cubic centimeters. Next day and the day after, she lies upon her left side without vertigo appearing. May 22, at 2 a. m., while lying upon her left side she suddenly awakened; "at first she thought she was hungry, then it seemed as if the ceiling were about to fall on her." Nauseated, she was obliged to sit up in bed, her face very pale. Since then she has had no vertigo and feels much better.

She went out May 23.

The hearing tests show no great change, as the subjoined table indicates:

	Right Ear.		Left Ear.	
	Before Politzer.	After Politzer	Before Politzer	After Politzer.
Watch air	.01		Barely, on contact	
Whisper	Heard slightly (?)		0	
Voice	.02		Heard (?)	
Fork, air	12"		12"	
Fork, bone	30" 35"		25" 27"	
Weber			Positive	
Gelle	No change		No change	
Paracusis	Positive		Positive	

Summing up, there appears to be an improvement of the tinnitus and vertigo (although she had violent vertigo the day before leaving). She says, also, that she hears better, but the hearing tests have not changed and the words which we use in testing not being varied, her apparent improvement in hearing is perhaps due to guessing the whispered words which have already been spoken aloud to her.

We saw her again June 15. She had not had any vertigo. The tinnitus was less. Same hearing tests.

Seen again July 29, 1904. The tinnitus is more severe than before puncture. The deafness, according to her companions, has increased. The vertigo has remained less fre-

quent. However, she again had, about July 13, a violent vertigo at night, similar to the one she had before leaving the hospital.

Case IV. Old luetic. Stigmata of Hysteria. Vertigo. Deafness. Unilateral Tinnitus. Improvement of the Vertigo. Increase of the Tinnitus.

Mme. G—, forty-eight years, complaining of deafness and tinnitus of the left ear with vertigo, entered the Lariboisiere July 10, 1904.

The beginning was four and a half years ago. She was then taken with great vertigo, lasting two hours, falling, but no loss of consciousness, and which seemed to be accompanied by troubles of a different nature, for, at the moment, she understood what was said to her, but was unable to reply. At this time the tinnitus did not exist.

Six months afterward she at times was very fatigued and again had attacks of vertigo with palpitation of the heart: she did not fall, but had to support herself by something while walking.

From May to August, 1900, she had vertigo every day with noises in the left ear at the time which seemed less acute of hearing as if it were stuffed up.

At this time she was treated at Lariboisiere where she was given cachets of zinc valerianate and some pills which she was only to use during a severe attack of vertigo, and of which not more than three were to be taken. She only had occasion to use a single pill. Immediately after taking it the tinnitus suddenly disappeared, "it seemed to her as if everything suddenly became silent."

But the tinnitus soon reappeared and remained continual: the vertigo intermitted every month, every six weeks, sometimes every two months. This vertiginous state was interrupted by severe vertigo with falling and pronounced palpitation of the heart. In January, February and August, 1904, the severe vertigo recurred as often as three times a month, accompanied by repeated hiccoughs and, on the following day, for three or four hours, by a sensation of a lump in the throat.

Since then she has almost continually had little spells of vertigo four or five times a month.

The noises she feels are of two sorts:

1. The noise of a saw sawing stone, very rapid, not synchronous with the pulse.
2. The noise of water falling.

Patient is pale, cachectic.

Six years ago she had specific symptoms, diagnosticated and treated at Saint Louis.

The left tympan seems normal in color and tension; the malleus is immobile with the Siegel. Tube permeable. Sensitiveness of the membrana and external canal greatly diminished.

On the right no apparent lesions of the membrane; malleus entirely mobile; no sensory trouble of the membrana or canal. Tube permeable.

Movements of the head to right or left cause vertigo.

The pharyngeal reflex barely exists. The patellar reflex is normal. No narrowing of the visual field.

Examination of the viscera and the urine shows nothing abnormal.

With the specific history, she was submitted to treatment. Three injections of calomel were made without success.

July 12, 1904. Lumbar puncture (15 cubic centimeters); the liquid escaped drop by drop, very slowly. She appeared to get immediate relief, for as soon as the puncture was finished, she answered, in reply to a question, that she could turn her head to right or left without fear of oscillation.

July 13. Slight vertigo; it seems to her as if the bed moves.

July 15. The vertigo no longer exists. She says that her head is lighter, but the saw noises are more intense than ever.

July 19. Vertigo has returned but is less severe than before puncture. But the saw noises are much worse than before puncture, and she complains of a continual occipital headache, which she did not have before, except during the spells of vertigo.

July 21. Has no more vertigo, but the tinnitus is continually severe.

July 24. Has had another vertigo, passing off quickly. Another puncture (15 cubic centimeters). The tinnitus does not diminish.

Vertigo provoked by compression in canals—Right negative; left positive.

Tubes. Permeable.

Mallei. Movable on right.

Pupillary inequality. Right pupil much dilated.

	Right Ear.		Left Ear.	
	Before Politzer.	After Politzer.	Before Politzer.	After Politzer.
Watch, air	4 meters		Contact	
Watch, bone	Heard		Heard in right	
Voice	Normal		.50	
Whisper	3 meters		0	0
Fork, air	23"	45"	12"	0
Fork, bone	19"	25"	17"	A little, distinctly
Weber	Indifferent	Gone on right	Indifferent	
Rinne	Negative		Negative	Negative
Gelle	Positive (?)	Negative (?)	Positive (?)	Negative (?)
Paracusis	0		Hears a sound	
Galton	Heard		Heard	Heard distinctly

Examined in the ophthalmic clinic there were found the specific lesions of choroiditis, with pupillary inequality and paralysis of accommodation.

At the first examination there was found a left hemi hyperesthesia which was not found at the examination some days later.

July 26. Still no improvement in the tinnitus which tends rather to increase.

July 29. No improvement in vertigo or deafness. She can bend her head without inducing vertigo, but this has "a tendency to reappear."

Case V. Otitis sicca. Immobile ossicles. Deafness and tinnitus. Labyrinth insufficiency, slight improvement of the tinnitus.

M. P—, carriage driver, forty-three years of age, came to Lariboisiere for deafness and intolerable tinnitus, May 9, 1904.

The affection began in November previous. Following a cold he noticed that his left hearing was impaired. He was examined in a clinic where, after an insufflation of air into the Eustachian tube, he was immediately attacked with hissing in the ear and a slight vertigo, which disappeared almost immediately. Since then he hears badly with his left ear and the hissing persists. He does not seem concerned about his right ear, in which the hearing is, nevertheless, not very acute.

The tinnitus is of two kinds:

1. Hissing, like jets of steam, synchronous with the pulse (right ear only).
2. A diffuse humming through the entire head.

He is a strong man, full blooded, red faced. No syphilis. No apparent lesions of the viscera. Nothing in the urine. No alcoholism.

He complains mainly of the tinnitus, also of the deafness, which keeps increasing.

The deafness is less pronounced amidst noise and in the street than in his room.

	Right Ear.		Left Ear.	
	Before Politzer	After Politzer	Before Politzer.	After Politzer
Watch, air	Contact		0, even contact	
Watch, bone	Slight		Nil	
Whisper	Contact		0	
Fork, bone	10"		15"	
Rinne	Negative	Negative	Negative	Negative
Weber			Left	
Paraensis	Positive		Positive	

Membrana. Immobile on right.

Tubes. Permeable.

Nose. Pharynx. Nothing of note.

May 13, 1904. Drew off 15 cubic centimeters of cephalorhachidian fluid which came out under great pressure. He complained at once of headache, but during the following day he was much relieved. The humming in the head almost completely disappeared; the hissing persisted.

May 20. Redoubled tinnitus which has never been so severe.

May 22 and 24. Two punctures made. The patient feels much relieved; the tinnitus is greatly diminished, at times disappearing completely. The humming is much less. Often of mornings the tinnitus is gone but returns during the day.

He went out May 25. At this time the watch is heard on the right at 2 centimeters, on the left at contact, the Schwabach is 13 seconds, right and left.

June 20 we again saw him. Conversation is always difficult; humming and hissing have reappeared, "maybe a little less strong."

Case VI. Otitis sicca. Immobility of the malleus. Deafness without vertigo or tinnitus. Lumbar puncture. Objective improvement.

Mme. Hey, forty years, came to the Lariboisiere for bilateral deafness.

On the right she had not heard since the age of ten years; at that time she had terrible pains in the ear which ceased after one day without suppuration.

A year ago the left ear was attacked. At the beginning she had blowing noises for eight days; then the tinnitus ceased but the deafness has increased.

She was treated by insufflation at the Sourd-Muets for six weeks without result.

Nose and pharynx healthy.

Examination of the urine—nothing abnormal.

On the right the drum is almost normal, not retracted, but the malleus is scarcely mobile.

On the left the membrane has sclerotic streaks; the handle of the hammer, slightly retracted, is rather immobile.

March 3, 1904. Lumbar puncture; 20 cubic centimeters of cerebro-spinal fluid. No immediate change, but a half-hour afterward, severe frontal headache. She does not dare sit up in bed for she then feels a little vertigo until she lies down and stretches out perfectly still, without turning her head to right or left.

	Right Ear		Left Ear.	
	Before Politzer	After Politzer	Before Politzer	After Politzer
Watch, air	0	0	0	0
Watch, bone	0	0	0	0
Voice	Contact		Contact	0
Whisper	0	0	0	
Fork, air	0	Perceived	0	Perceived
Fork, bone	25"	25" 24"	25"	25" 24"
Weber	?	?	?	?
Paracusis		0	0	0

Siegel. Hammer little mobile on right.

Tube. Right permeable.

March 6, the condition was as follows.

Right ear: Fork, air, moderately struck, 7" 8"; fork, bone, 25"; watch, air, 1 centimeter; voice, 35 to 40 centimeters; whisper, not changed.

It appears, then, that there is a slight improvement, but the patient does not find it so, and on the 12th went home. The vertigo has disappeared, but the headache persists.

Case VII. Deafness. Vertigo. Tinnitus. Lumbar puncture. No improvement.

Coud —, 26 years, agriculturist, came to Lariboisiere July 15, 1904, for deafness, vertigo and tinnitus.

He lost his mother when he was five and his father when eleven.

The deafness is bilateral, total on the right. On the left less marked but pronounced.

The right deafness dates back ten years; it came on slowly and progressively.

In the month of October, 1903, he became suddenly deaf in the left ear; then, two or three days later and also suddenly, he had two attacks of vertigo which caused him to fall under his plough. He saw objects whirling about in a horizontal plane and he was swept along with them, but he did not lose consciousness. These phenomena were accompanied with intense tinnitus in the left ear. At the same time the right ear, which had been exempt before, began to have severe tinnitus, which has since continued.

Since that time the vertigo comes on twice daily, causing him to fall.

The tinnitus consists of a humming on the left, a hissing on the right. They are worst during the vertigo.

Examination shows the right drum to be somewhat opaque; the malleus is completely immobile with the Siegel. Normal sensitiveness of the membrane and canal.

The left drum has a normal appearance. The hammer is slightly retracted and not very mobile.

	Right Ear.		Left Ear.	
	Before Politzer	After Politzer	Before Politzer.	After Politzer.
Watch, air	1 cent.	1 cent.	5 cent.	5 cent
Watch, bone	Positive		Positive	
Voice	Scarcely, 0.25	Slight improvement	2 m. for words, 3 for conversation.	2m for words, 3 for conversation.
Whisper	0.15 m	0.15m	0.40 for words	0.40 for words
Fork, air	0; if hit hard 5"		20"	
Fork, bone	20" average	24" 25"	27"	24" 25"
Weber	Indifferent		Indifferent	
Paracusis	0		Positive	

Siegle. Malleus immobile on right.

Tubes. Permeable.

Sudden rotary movements of the head do not provoke vertigo.

Romberg's sign: oscillates especially forward and backward but also from right to left.

Patellar reflex gone.

No Argyle-Robertson sign.

No anosmia.

Examination of the viscera shows nothing abnormal. Urine contains neither sugar nor albumin.

Patient remained at the Pitie, in the service of Dr. Babinski from May to July. Three lumbar punctures were done upon him without success.

After the first puncture he had a little relief, but since then vertigo and tinnitus have recurred with the same severity.

* * * *

Looking over our cases, we may consider the results from the triple point of view of deafness, tinnitus and vertigo.

I. As far as deafness is concerned we may enunciate the following:

(a.) We have never had improvement in hearing for conversation.

(b.) Sometimes we have had slight improvement for hearing of words, spoken or whispered.

(c.) Sometimes, also, an increased duration of air or bone perception of the fork.

But these observations while interesting to record, have no interest from the therapeutic point of view with which we are concerned. What the patient wants is not to hear the sound of a fork better, but conversation. Moreover, these notations may not be absolute, for the perception of the fork vibrating upon the cranium varies considerably, according to whether it is applied to the antral region, the mastoid tip or the temporal region. Are we sure, in the course of repeated examinations with an interval between, to apply the stem of the fork to the same spot? It would be excellent to have an unvarying acoumetric apparatus, making it possible to measure and compare different auditive values.

II. As for tinnitus, we have one lasting improvement, two transitory, one *statu quo*, and one increase (case III).

III. Vertigo seems to be more affected than the other two symptoms.

In five cases of vertigo, we note three marked improve-

ments (cases I, III, IV), and two failures (cases II and VII).

The improvement is clear in the sense that the patients say that they are relieved (they are the sole judges), and we have noted two objective ameliorations (cases III and IV), because in one of these, dorsal and left lateral decubitus, impossible before puncture, and, in the other, rotatory movements of the head, became easy without provoking vertigo.

In all these fortunate cases as well as those in which tinnitus was relieved, our patients claimed to have a sensation of light headedness, "as if the head were off."

But we have had no absolute cures. On the eve of her departure, case III, which was much relieved, again had a terrible vertigo in the night.

To sum up:—In the cases of otitis which we have treated, aside from amelioration of the vertiginous symptoms, within the limits and proportions just stated, the other annoying symptoms have been rebellious.

There does not appear to exist any relation between the improvement obtained and the tension of the cerebro-spinal fluid at the moment of puncture.

The patients who have been most improved (cases I and III), showed very pronounced vaso-motor troubles in the head region, and it may be asked if general treatment might not produce the same effect in these patients as rachicentesis.

We may add, finally, that in case VI, the headache following puncture has not disappeared two months and a half after the operation.

XIII.

THE APPEARANCE OF THE FUNDUS OCULI IN DISEASES OF THE EAR.

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In 1881, Zaufal² said the following in regard to the connection between the fundus oculi and diseases of the ear:

"In determining the indications for trepanation of the mastoid process, the ophthalmoscopic findings are absolutely necessary. An extension of the inflammation from the middle ear into the cranial cavity may be revealed at a time when distinct violent subjective or other symptoms are not yet present. The influence of trepanation on the cranial condition can be most plainly observed in the subsidence of the papillary and retinal changes. In the clinic at Prague, changes were invariably found in the fundus oculi in every case where an intracranial complication followed a disease of the middle ear."

Twenty years later, Hansen³, in Schwartze's clinic, came to the following conclusions, at the end of his extensive investigations as to the appearance of the fundus in otitic intracranial diseases.

"Whenever changes in the fundi of the eyes appear in the course of an acute or chronic suppuration of the ear, it indicates the presence of an intracranial complication: for that papillary changes can be caused by a middle ear suppuration alone, without an intracranial affection must be regarded as an improbable and unproved assumption. If papillary changes, no matter whether mild or severe, have been observed during aural suppuration, it is an indication for immediate opening of the mastoid, however doubtful the other indications have been."

I have used the material in the ear clinic of the Royal Charite in Berlin in studying the same problem. The period has extended from December, 1893, to the present, i. e., more than ten years. Before I pass to my subject proper and the analysis of my findings in those patients in whom an otitic affection of the brain, membranes or vessels was found either during operation or post-mortem, I will discuss the question whether or not changes on the fundus can occur as sequelae of simple middle ear or mastoid diseases without a complicating intracranial affection. The literature on the subject is very scanty.

Jansen⁴ in his work on "Sinusthrombose nach Mittelohr-eiterungen" reports 15 cases of changes in the fundus in uncomplicated diseases of the middle ear or mastoid, most of which are not free from objections. He says about as follows: "Choked disc or neuritis optica seems, in very rare cases, to be present in uncomplicated empyema of the mastoid or otitis media."

In regard to the cases cited by him, he says that he cannot avoid the belief that these cases were due to a sinus thrombosis with or without a serous arachnoiditis.

During a criticism of Barker's explanation, that a papillitis during a simple otitis media suppurativa was caused by the extension of the inflammation to the lymph vessels from the region of the optic nerve, which run in the carotid canal, Koerner⁵ also seems to accept the presence of changes on the fundus in spite of lack of intracranial disease.

I take the following opinion of Bezold from the recent book of Eversbusch²: "The Diseases of the Eyes, in Relation to Diseases of the Nose, Accessory Sinuses and Ear," (page 119). In 100 cases of otitis media acuta or empyema of the mastoid which needed operation, changes in the fundus were found 23 times, of which 10 cases were uncomplicated empyema. In the same place (p. 121), is a communication of Schubert, who observed a simple capillary and venous injection of the papilla without retinal changes, which was frequently transitory, in cases of acute suppurations of the middle ear which healed spontaneously.

In glancing over my cases, I found the following:

Case I. Hans W., fourteen and one-half years old, from July 28, 1902, to January 7, 1903.

Patient had measles and scarlet fever at age of 3 years, without involvement of the ear. In June, 1902, a discharge of pus was observed from the left ear, without previous dis-

ease; July 7, paracentesis, left side; polyclinic treatment; as the discharge did not cease, patient was sent to the hospital for operation.

Findings on entrance, July 28.

Slender, fairly well-nourished youth with stigmata of rickets; healthy internal organs; temperature 36.7° ; pulse 102. Pupils of same width, reacting promptly; Romberg negative, normal functioning cranial nerves; absolutely no cerebral symptoms. No tenderness on striking the scalp or mastoids. Slight tenderness to pressure on the left tragus. Ear findings—left external meatus very narrow, filled with a greenish yellow, fetid pus; after removal of this, granulations hanging from above and anteriorly; white masses in the free space; right ear normal except for slight cloudiness of the drum.

July 31. Removal of granulations from left ear.

Aug. 14. Temperature 38.7° ; edema of left mastoid, apex sensitive, superior wall of meatus bulging. Ophthalmoscopic findings—Slight venostasis in the left fundus.

Aug. 15. Normal temperature; persistence of local symptoms.

Aug. 16. Radical operation left side; bone sclerotic; in antrum and middle ear cholesteatomatous masses, partially purulent. Anvil carious, hammer imbedded in granulations; 2 centimeters of sinus wall laid bare; found soft, yielding, unaltered. Evacuation of diseased tissue, plastic, bandage.

Aug. 21. Dressed, course normal.

Sept. 3. A perichondritis of the auricle was caused by a pyocyanus infection which kept him at the hospital until January 7. There never was any cerebral symptom; unfortunately, I found nothing further ophthalmoscopically.

We find, then, during the second month of a chronic sup-puration of the left middle ear and mastoid cells, a slight change in the fundus of the eye on the same side as the diseased ear, a change which was limited to venous alterations. Neither the clinical course nor findings, during the operation allow the assumption of an intracranial, pathologic process.

Case II. Max N., 27 years old; printer.

Patient for 20 years has been very deaf on both sides, following measles; there is a foul, occasionally bloody, discharge from both ears.

Findings at entrance—Strong young man; internal organs

healthy. No tenderness on striking the scalp or mastoid. Examination of nerves and brain showed that they functionated normally. Aural findings—Bilaterally, somewhat stenosed meati, extensive destruction of drums, and evidences of a long existing suppuration of the middle ear.

Ophthalmoscopic findings—Left: Borders of disc indistinct, especially toward the nose. Right: On the nasal side hyperemia of disc, with indistinct borders.

March 14. As the secretion from the left ear had diminished, and the patient showed no untoward symptoms, he was discharged with the injunction to drop resorcin into the ears.

Case III. Bernhard A., 9 years old; July 20 to Oct. 20, 1903.

Since childhood chronic suppuration of right ear, with acute exacerbation for 14 days, accompanied by intense ear-aches and swelling of the postauricular region.

Findings on entrance, July 20:

The delicate boy gave a bad impression. Temperature 38° ; pulse 150, regular; internal organs healthy, except for the changes caused by the fever (tachycardia, etc.). Scalp not sensitive to percussion; movement of head free in all directions; pupils equal, react; ocular movements free, no nystagmus, no Romberg, no Kernig, no cerebral symptoms.

Aural findings—Right auricle stands off from the head like a wing; behind it a diffuse, soft swelling. In the right meatus, purulent, fetid secretion, posterior meatal wall protruding; left drum retracted and cloudy.

Ophthalmoscopic findings—Left: Borders disc indistinct, sharply defined below and outwards. Right: Borders of disc indistinct, intense hyperemia of fundus.

July 21. Operation on right side; opening of subperiosteal abscess, and bone. Bone sclerotic; in the antrum, aditus and recessus epitympanicus purulent, fetid cholesteatomatous masses; middle ear filled with granulations; hammer and anvil carious, stapes imbedded in granulations. In the lateral semicircular canal, a fistula about one-half centimeter long filled with granulations; stapes removed from oval window; granulations curetted out of the niche, and the latter enlarged; vestibule free from pus and granulations; dura of the middle cranial fossa laid bare, unaltered.

July 22. Ophthalmoscopic findings (v. Haselberg)—Right: Neuritis optica. Left: Beginning neutritis optica.

The wound took the normal course; Sept. 5, moderate nystagmus observed. Oct. 20, discharged, improved.

Case IV. Mrs. H., from March 24, to April 7, 1903.

Two days before admission, had earache and feeling of both ears being stopped up, following influenza; after paracentesis, considerable discharge. March 25, the examination showed acutely inflamed drums; all other findings normal.

Ophthalmic findings—Left: Borders of disc indistinct. Right: Border of disc indistinct nasally.

April 2. Inflammatory symptoms on both sides receded. April 7, discharged after 2 weeks' treatment.

Case V. Ida G., 31 years old, from Aug. 11, to Sept. 17, 1903.

About the middle of July, 1903, patient had, as she says, a left-sided pleuro-pneumonia, in the course of which there appeared, Aug. 1, an acute inflammation of the right middle ear; purulent discharge from right ear and pain on pressure on right mastoid. Admitted Aug. 11. Well built woman, with appearance of suffering; over the left lower lobe, some shortening of sound; on inspiration, bronchitic rales, some cough accompanied by stitch in left side. Pupils equal, reacting promptly, slight nystagmus towards both sides, no cerebral symptoms, no sensitiveness to percussion of the scalp.

Aural findings—Soft parts behind the ear moderately infiltrated. Mastoid sensitive to pressure; in right meatus, sanguinopurulent, non-fetid secretion. Drum reddened, protruding postero-superiorly; pulsating light reflex below; left ear normal.

Ophthalmic findings—Bilateral hyperemia of fundi.

Aug. 12. Mastoidectomy; cells filled with bloody granulations, little pus; antrum contains small amount thick pus; dura of posterior cranial fossa laid bare, normal; slight caries of bone. Normal healing of wound, and good condition of patient until her discharge, Sept. 17.

Out of the vast number of uncomplicated suppurations of the middle ear and mastoid, coming from a material spread out over ten years, (if one neglects the few cases without ophthalmoscopic findings) I could find only five cases with changes on the fundus oculi. This occurred twice in acute disease of the ear. In case IV, there was an acute suppuration of both middle ears which rapidly got

well. In case V, there was an acute suppuration of the right middle ear with involvement of the mastoid.

In the first case the fundal changes were limited to an indistinctness of the borders of the discs on both sides, on the right side only at one place; in the second case they were limited to hyperemia of the disc and retina. In the three other cases, there was a chronic middle ear process, twice accompanied by mastoid involvement. The ophthalmoscopic examination gave in case I changes in the veins of the same side as the diseased ear; in case II, hyperemia and partial indistinctness of the borders of both discs; in case III, the hyperemia of the disc and retina developed, after the operation, into a neuritis optica. We see everywhere changes of the mildest nature, until we come to case III, which, on account of the presence of a fistula of the semicircular canals, and the communication established thereby between the diseased focus and the cranial cavity, should strictly speaking, be excluded from this group. Cases of this kind, as well as the observations of Schubert referred to above, viz., transitory capillary and venous hyperemia in acute suppurations of the middle ear, speak for the development of fundal changes in consequence of simple diseases of the middle ear and mastoid and allow the conclusions, drawn by Hansen, Ostman, Gradenigo and Delstanche from the appearance of even the mildest ophthalmoscopic changes, to be regarded as not entirely correct. On account of the extraordinary rareness of such cases, however, the demonstration of fundal changes is always *signum mali ominis* and indicates surgical intervention.

I should like to call attention to a group of ear diseases in which the symptoms are especially severe, expressive of a disease within the cranial cavity. The clinical appearances seem to demand the earliest surgical interference. The puncture made for the purpose of demonstrating a brain abscess frequently yields a large amount of cerebrospinal fluid under pressure flowing out of the reticulated pia mater, or ventricles. Thereupon, the urgent symptoms usually disappear at once or slowly recede. These cases are to be regarded as a meningitis serosa caused by suppuration of the ear or temporal bone, either of a toxic nature, or a collateral edema accompanying the suppuration. I subjoin the following cases (Cases I and II have already been published in the *Deutsch. med. Wochensch.*, No. 45, 1899, p. 736).

Case I. Auguste K., 23 years old, from Sept. 10, 1898 to May, 1899.

Following an antrotomy done in May, 1895, for an acute empyema of the left mastoid, the patient frequently suffered from attacks of headache and dizziness. Since Sept., 1898, the trouble had been so severe that the patient had to come to the clinic. Findings on admission Sept. 9, 1898—Skull sensitive to pressure, on the left side; paresthesia; diminution of sensibility and motor power of the extremities on the right side; ptosis of the left lid; Romberg, falling towards the left side; pupils react; pulse 60. Aural findings—Drum retracted on both sides.

Sept. 15. Operation on the left side. Old operation cavity dry, bone necrotic, no granulations, the dura, formerly laid bare, dry, thickened, milky colored, of normal aspect when laid bare to a greater area. Puncture and incision of the dura over the temporal lobe: on incising the dura, a large amount of serous fluid apparently under high pressure was obtained; no pus. Pulse at the end of the operation 60.

Ophthalmoscopic findings (before the operation)—Intense venous hyperemia of both retinas and discs.

After the operation, sensorium free, pulse 84, bandage drenched.

Sept. 17. Sensorium free, motor weakness of the right extremities receded, ptosis disappeared, no headache, no vomiting, bandage saturated with a serous fluid.

Sept. 20. Ophthalmoscopic findings—Both sides normal, no hyperemia, pulse 70.

The healing of the wound was completed in April, 1899; in May, 1899, the patient was discharged, although all the nervous symptoms had not disappeared; the patient cannot walk alone; becomes dizzy and falls towards the left side; the sensibility of the right side, decreased; sensorium free, fundi normal.

Mueller who published the case, considered the cause of the urgent cerebral symptoms to be a meningitis serosa, which is confirmed by their prompt disappearance after the operation, and the abnormally large discharge of the cerebrospinal fluid. The hemiparesis he explains by a partially acute encephalitis serosa sinistra. As to the fundi, when the patient was admitted a considerable hyperemia of the disc and retina was found, which became less after the operation, to disappear two weeks later and remain normal.

Case II. Mrs. G., 31 years old, from November 21, 1898, to March 15, 1899.

Since 12 years of age, suppuration of the ear, following diphtheria. About the end of October, 1898, headache, dizziness and vomiting appeared several times a day: was admitted to the hospital November 21, and sent to the ear clinic on account of the suppuration of the left ear.

Findings on admission November 28, 1898—Complains of great weakness, headaches, dizziness, vomiting, trouble with thinking. Walk uncertain; Romberg, sways; sensorium not entirely free. No paralysis, aphasic or ataxic disturbances. Temperature normal, pulse 66, pupils wide, do not react, the left temporal region sensitive to percussion.

Aural findings—right drum shows cicatrix; fetid pus in left meatus, drum reddened, perforation over the processus brevis.

Ophthalmoscopic findings—Right: Disc pale red, edematous, arteries not visible; veins extremely dilated. Left: Same findings, but not so intense; no hemorrhage (Brecht).

Dec. 3. (5 days later.) Radical operation on left side, and opening of left temporal lobe. Cholesteatoma in antrum, recessus epitympanicus; dura not pulsating, protrudes considerably. Incision into the brain, and dilation with the forceps gave no pus.

Dec. 6. Pulse 66, dizziness; bilateral pronounced choked disc. Incision into the cerebellum gave no pus; no improvement immediately after the operation.

Dec. 11. Choked disc increased (6-7 D.)

Dec. 16. Choked disc still further increased (9 D.)

End of December, condition worse, unconsciousness; vomiting, evening temperature 38°. Prolapse of temporal lobe and cerebellum.

Jan. 2. Both choked discs receded.

Jan. 13. Bandage saturated with serous fluid.

Jan. 16. Ophthalmoscopic findings—Swelling of discs slight, borders very indistinct; veins full and tortuous.

Jan. 18. Condition good.

March 14. Ophthalmoscopic findings—Both discs still red, borders indistinct (Brecht).

March 18. Discharged. Patient feels nothing abnormal.

Case III. Arnold F., 20 years old, from May 22, to June 13, 1903.

The right mastoid of patient was opened (Jan. 6, 1903) on account of a mastoiditis dextra, which followed a bilateral

otitis. It is said that on Jan. 24, there were symptoms of meningitis, which quickly disappeared. May 22, the following were found—Strong, somewhat pale, young man, with healthy internal organs, with no cranial nor nervous affections. Temperature 37° , pulse 76; Aural findings—Right meatus somewhat stenosed; drum cloudy; behind the auricle, in the region of the operation-scar is a fistula, from which considerable pus is discharged.

Ophthalmoscopic findings—Left: Borders of disc indistinct.

May 22. Operation. The granulations were removed from the left operation-wound, the sinus laid bare, its walls covered with granulations and somewhat thickened. Neighboring granulation tissue contains pus; dura of middle cranial fossa normal.

May 23. Patient feels fine after operation.

May 25. Ophthalmoscopic findings—Borders left disc indistinct (v. Haselberg). Nystagmus towards left side; general condition good.

May 26. Left pupil reacts slower than right; pulse 61.

Lumbar puncture gives clear liquor cerebrospinalis, discharged under increased pressure, which contains no bacteria nor leucocytes.

May 27. Repeated vomiting; pulse 58; pupils equal, reacts promptly; complains of frontal headache.

May 28. Ophthalmoscopic findings—Right: Nothing abnormal. Left: Plain neuritis optica (v. Haselberg); pulse 60; no sensitiveness to percussion of scalp; movements of head free in all directions.

May 29. Pulse between 45 and 50; no vomiting, no dizziness, consciousness clear, no nervous disturbances.

June 7. Ophthalmoscopic findings—Left: Medial border of disc indistinct; temporal healthy.

June 13. Right middle ear dry; patient discharged in complete health.

Ophthalmoscopic findings—Borders of left pupil still indistinct, sharper towards the temporal side.

Case IV. Hermann K., 20 years old, April 11 to June 6, 1900.

Suppuration of right ear since childhood; for 8 days pain behind right auricle, severe headache. On admission, April 12, there was a swelling of the region over the right mastoid, with sensitiveness on pressure; from the right meatus comes fetid pus, but the meatus is so stenosed that it is impossible

to see deep into it. Pupils same size, react promptly; no special nervous disturbances.

Ophthalmoscopic findings—Bilateral incipient choked disc.

April 14. Radical operation right side; cells of the mastoid, antrum, middle ear, and a part of the bony meatus occupied by cholesteatoma; bone slightly carious. Punctures of the cerebellum yielded a serous fluid.

April 15. Condition good; April 19, occipital headache.

April 20. Temperature 39.2°; bilateral choked disc.

April 21. Right pupil larger than left. April 23. Bilateral choked disc; fresh hemorrhages.

April 25. Plain difference in pupils; choked disc less on both sides.

May 9. Slight edema of discs.

June 6. Right disc indistinct on the nasal side; left disc cloudy; discharged, improved.

Case V. Herman P., 11 years old, December 13, 1901 to February 11, 1902.

Since August, 1901, purulent discharge from the right ear; November 2, dizziness, vomiting, increased temperature for 14 days, delirium. Admitted Dec. 13, 1901.

Delicate boy with prominent tubera parietalia as a sign of previous rickets; internal organs healthy. Temperature normal, pulse 96, left pupil smaller than the right.

Aural findings—Left drum cloudy; right, sinking of the posterior meatal wall, the depth not plainly seen.

Ophthalmoscopic findings—Bilateral, plain neuritis optica, borders of disc indistinct, veins tortuous.

Dec. 19. Operation; at the site of the spina suprameatum is a yellowish white tumor of the size of a hazel nut, cholesteatoma which has broken through the mastoid; antrum, recessus epitympanicus filled with cholesteatoma; sinus lies free at one place, tegmen intact.

Dec. 20. Temperature normal, pulse 96, feels good.

Dec. 21. Borders of both discs much sharper.

Dec. 24. Hyperemia of right disc, left normal.

Dec. 27. Both fundi normal.

Jan. 4. Slight hyperemia of both discs (v. Haselberg). Temperature normal, pulse 96.

Jan. 8. Discs not distinguishable from red fundi, not prominent. Condition good.

Jan. 29. As the hyperemia of the discs did not disappear,

lumbar puncture; diminished pressure, culture sterile, no tubercle bacilli.

Jan. 30 and 31. Nausea, irregular pulse. Feb. 3. Complaints of dull feeling in the head, pulse 68.

Feb. 10. Fundi almost normal (v. Haselberg).

Feb. 11. Discharged. On Sept. 30, 1902, was again admitted for the purpose of closing the retroauricular opening, and was normal in every respect.

Case VI. Herman E., 56 years old, May 19, to July 3, 1896.

For several years, patient has suffered with an affection of both middle ears; he came to the clinic complaining of deafness, pain in the left ear and occiput, dull feeling in his head. Findings on May 19 showed a normal condition of all organs, pulse 72; aural examination showed cicatricial changes in both middle ears, a slight, purulent secretion in left ear.

May 23. Headaches, frequent vomitings, temperature 37, pulse 80; patient peculiarly sleepy.

May 26. Vomiting early in the morning; intellect clear.

May 28. Left pupil reacts slowly; right dilated, does not react to light.

Ophthalmoscopic Findings—Left: Slight prominence of disc; borders somewhat indistinct; veins more tortuous than normal. Right: Borders of the disc covered; veins tortuous; no hemorrhage; neuritis optica.

May 29. Temperature 37; headache.

June 4. Patient occasionally complains of double vision; local treatment of the ear.

June 15. Ophthalmoscopic Findings—Left: No difference in the refraction between the disc and retina; the lower veins still somewhat tortuous, otherwise normal.

July 3. Discharged.

Case VII. Emil H., 14 years old; was admitted October 30, 1903, with a bilateral otitis media acuta; after repeated paracenteses of the drums, a large flow of pus was obtained from both ears; this soon diminished, so that the patient could be discharged November 20th. In a few days there appeared an occasional slight rise of the temperature and pain in the right mastoid. During this period the patient showed symptoms of dizziness, some nystagmus on movements of the eyes toward the right, headache, very pronounced Romberg's symptom. The mastoidectomy, made December 4th, gave only hyperemia of the bones, a

somewhat mucous secretion in the antrum, no granulations; on puncturing the dura of the posterior cranial fossa, there was obtained a large amount of clear liquor cerebro-spinalis, under high pressure; the bandage later was saturated with a serous fluid. Repeated lumbar punctures likewise yielded a clear liquor cerebro-spinalis, which was found free from germs. Repeated examinations of the eyes always showed normal fundi.

The condition gradually became better, so that the patient could be discharged.

Among the seven cases of this group, with the clinical symptoms of intracranial affection without demonstrable pathologico-anatomic changes, we found only in one case (No. VII) that the fundus was free from lesions. In the six other cases there were five times a high degree of fundal changes (neuritis optica or choked disc), once No. I) only hyperemia of the disc and retina, although very pronounced.

The changes were found in both eyes, either in the same degree or with a slight difference. Case No. 3 is noteworthy because the change was only on one side, i. e. on the side where the aural affection had been quiescent for some time, and where the mastoid was healthy, while the suppurative process affected the middle ear and mastoid of the other side. (In this case the ophthalmoscopic examination was repeatedly made by the assistant to the eye clinic, Dr. v. Haselberg, and the fundus on the side of the diseased ear was always found healthy. The control of the ophthalmoscopic findings was nearly always made by specialists, which was easy on account of the intimate connection of the clinics in the Charité.)

The development and course of the ocular lesions sometimes paralleled the other intracranial symptoms, diminished after the operation and disappeared in a few weeks as in Case I; in case II the obstruction symptoms became worse after the operation: 13 days after the operation increase was still observed, accompanied by other symptoms of cranial pressure which still persisted in spite of the operation, and recession took place after one month. In Case III the opticus lesion remained at its height six days after the operation, and was still to be seen when the patient was discharged, three weeks later. Case IV showed the same condition. Case VI entered with the cranial symptoms of neuritis optica, which receded after 15 days.

Every case where the cranial complication of the aural

affection was confirmed by the operation or autopsy is tabulated in the following:

Case 1. Anamnesis—Richard D., 34 years, February 5 to 12, 1894; chronic suppuration of the right middle ear; fever and chill just before admission.

Findings and Course—Movements of the head to the side painful; intellect not entirely free; temperature 40.5° , pulse 108, twitching of the facial muscles; on the right side, slight swelling and redness of the soft parts over the mastoid, as far down as the neck. February 9th, operation on the right side, no retention of pus in the antrum; perisin. Suppuration, sinus apparently healthy. February 11th, temperature 39.5° , unconscious. February 12th, death.

Autopsy—Purulent thrombus of the right sinus transversus, circumscribed purulent arachnitis; perisinous abscess found at the operation.

Fundus—February 9th, both sides normal.

Case 2. Anamnesis—H. S., 20 years; June 26th to September 24th; chronic suppuration of the right middle ear; 14 days before admission, headache, vomiting, dizziness.

Findings and Course—Internal organs healthy, normal temperature, pulse 60, uncertain walk, headache, dizziness on standing up; right posterior meatal wall bulging, defect in drum, pus; left ear healthy. June 29th, operation, right; granulations in mastoid, middle ear; cerebellar dura laid bare, normal color, not pulsating. July 2d, during change of bandage the cerebellar dura is seen perforated; incision, brain substance necrotic; probe touches firm substance at depth of $1\frac{1}{2}$ cm., no pus. July 5th, good condition, pulse 72, gait still uncertain. August 8th, no headache, walk all right, wound almost healed. September 24th, discharged cured.

Operation—Cerebellar abscess (?) on right side.

Fundus—June 26th, bilateral choked disc. June 29th, distinct choked disc on both sides; right veins more swollen and tortuous than left. June 30th, choked disc unchanged. July 3d, choked disc recedes. July 8th, same. July 14th, borders of right disc plainer. July 27th, signs of obstruction considerably less; borders of disc distinct; veins still tortuous. August 10th, slight swelling of discs and retinas in their neighborhood, as far as the temporal borders; veins dilated. September 3d, fundi normal.

Case 3. Anamnesis—Carl K., 20 years; February 15 to March 14, 1895; chronic inflammation of right middle

ear; some days before admission, malaise, headache, vomiting, chilliness.

Findings and Course—Delicate man; temperature 38.8° , pulse 64; apathetic, slight stiffness of neck, fetid discharge from right ear. February 20th, pronounced stiffness of the neck, severe headache, hyperesthesia of the lower extremities; radical operation right side; cholesteatoma, carious destruction. February 21st, increased temperature, headache, stiff neck, pulse 46-60. February 27th, so far, relative good condition, temperature over 38° , clear intellect, twitching of facial muscles. March 7th, lumbar puncture gives fluid containing leucocytes. March 11th, temperature normal, pulse 72, relative good condition. March 14th, death.

Autopsy—Abscessus cerebelli dextri; arachnitis purulenta adhaesiva cerebellaris, pachymeningitis petrosa; hydrocephalus internus; abscess of the right half of the cerebellum size of walnut.

Fundus—February 16th, no changes. February 17th, same. February 23, borders of both discs indistinct. February 24th, bilateral beginning neuritis optica, borders indistinct, veins very full; left, changes greater. March 1, distinct neuritis optica. March 3d, neuritis optica greater. March 11th, border of right disc invisible; left indicated.

Case 4. Anamnesis—Aug. L., 25 years; August 21st to October 27th, 1894. Otit. med. dex. chron.; headaches for eight days, dizziness pain in limbs.

Findings and Course—Temperature 39.8° , pulse 88, severe headache, right mastoid painful; no nervous disturbances. August 22d, chill, right mastoid sensitive to pressure, headache, fetid pus in right meatus; defect of drum, granulations; Operation granulations and pus in mastoid cells, antrum, middle ear. August 23d, temperature increased, headache. Operation: perisinous abscess, one teaspoonful fetid pus; from sinus come pus and thick blood. August 24, temperature increased, pus in sinus. August 29th, temperature normal; course normal. October 27th, sent to polyclinic for treatment.

Operation—Purulent thrombosis of sinus transversus dexter; perisinous abscess right side.

Fundus—August 21st, normal.

Case 5. Anamnesis—G. S., 16 years; February 28th to March 14th, 1895. Bilat. chron. sup. m. ear, following influenza; since middle of February increase of ear affection, lately somewhat apathetic.

Findings and Course—Somewhat apathetic, passive movements of head painful, no nervous disturbances, left mastoid painful; fetid pus both ears, left post. meatal wall bulging; defects drums both sides. March 2, temperature 40°, chill, pulse 64. March 3d, operation left side; mastoid full of pus, sinus covered with granulations, apparently healthy, puncture gives fluid blood. March 5th and 6th, rise of temperature to 40°, chill. March 7th, incision of sinus yields fetid pus. March 9th, opening right mastoid, sinus and dura normal. March 11th, vomiting, pulse 68, left pupil wider than right, no reaction, left side ptosis and paralysis of abducens. March 12th, unconscious. March 14th, death. Fever typically pyemic during entire course.

Autopsy—Caries ossis petrosi utriusque; thrombosis sinus petrosi utriusque; pachymeningitis interna purulenta; encephalitis hemorrhagica cerebellaris; considerable pus between left occipital lobe and upper half of left cerebellum.

Fundus—March 1st: Left: external border disc sharp, internal indistinct; no swelling; no tortuous veins; clear retinal reflex. Right, Normal. March 12th: Left, plain choked disc. Right, less. March 13th, left, choked disc. 5-D.; right, disc swollen, borders hidden, visible only temporally.

Case 6. Anamnesis—K. B., 17 years; May 22 to June 6, 1895. Otitis med. chron. dex.; pain in right ear since middle May, chills and vomiting for two days.

Findings and Course—Strong, free sensorium; no nervous disturbances, internal organs healthy, no pressure sensitiveness of mastoid, right posterior meatal wall swollen, drum shows defect, size of pea, above, from which come epithelial masses. Temperature 39°. May 24th; operation, right side. Cholesteatoma, carious processes, lower third of sinus wall gangrenous, no pus in sinus. May 25th, slight nystagmus, movements of head painful, pus from sinus during change of dressing; ligation vena jug. May 27th, temperature 39°, chill. May 30th, chill, temperature 40°. June 6th, death; pyemic fever during entire course.

Autopsy—Thrombophlebitis petrosa et venae jugularis dextrae; arachnitis purulenta; pachymeningitis externa; base of arachnoidea cloudy, infiltrated.

Fundus—May 22d, both sides entirely normal (Prof. Burchardt).

Case 7. Anamnesis—Max B., 5 years; July 22d to July

27th; otit. med. chron. bilat.; fever and vomiting for several days.

Findings and Course—Strong boy, healthy internal organs, left mastoid painful; somnolent, very feverish, bilateral middle ear suppuration, left meatus stenosed, granular above and behind. July 24th, operation left; mastoid, antrum, middle ear full of granulations, sinus bathed in pus, not thrombosed; intellect clear after operation. July 26th, temperature between 39° and 40°; distinct stiffness of neck; pupils wide, no reaction; unconscious, convulsions, death.

Autopsy—Meningitis purulenta basil. hydrocephalus, no sinus thrombosis, perisinous abscess found at operation.

Fundus—July 22d, normal. July 26th, normal.

Case 8. H. H., 27 years; May 17th to May 19th; otit. med. chron. sup. sin.; chill several days before.

Findings and Course—Temperature 40.2°, pulse 96, unconscious, pain on movements of head and pressure on left mastoid; fetid pus left ear, pupils equal, react. May 18th, operation left side; bone sclerotic; cavities, little pus; sinus laid bare, walls necrotic, thrombus removed. May 19th, unconscious, opisthotonus, death.

Autopsy—Pur. thrombosis left side; pachymeningitis interna et arachnitis purulenta; internal face dura in region of sinus transv. covered with pus, sinus wall at one place decomposed; edema of arachnoidea, and base of brain.

Fundus—May 17th, both sides normal.

Case 9. Anamnesis—Mrs. G., 23 years; January 29 to February 15, 1896; Otit. med. chron. sup. sin.; treated in policlinic one week before admission for pain and discharge in left ear.

Findings and Course—Great malaise, slightly somnolent, fetid discharge left ear, meatus narrow, pulsating light reflex. January 31st, operation left side; cholesteatoma and purulent granulation in mastoid and middle ear. February 1st and 2d, very delirious. February 2d, abscess size pigeon's egg opened in left temporal lobe. February 6th, amnesic aphasia. February 15th, death.

Autopsy—Abscess left temporal lobe.

Fundus—January 31st, borders of both discs sharp (Prof. Burchardt).

Case 10. Anamnesis—M. B., 40 years; October 14th to 17th; Otit. med. chron. sup. dex.; headache, dizziness and uncertain gait since end of September.

Findings and Course—Not entirely conscious; right side,

slight ptosis and facial paresis; gait uncertain, Romberg's symptom present; right meatus stenosed, fetid pus. October 15th, operation right side; pus and granulation in mastoid; dura laid bare, healthy. October 24th, symptoms unchanged, temperature increased, headache; operation; laying bare and incision of temporal lobe and cerebellum; no pus; post operation temperature 39°, vomiting, somnolence. October 27th, death.

Autopsy—Purulent infiltration of pia of base; right cerebellar hemisphere shows discolored infiltration in region of sinus; right sinus trans. contains, in places, purulent thrombi.

Fundus—October 14th, normal.

Case 11. H. J., 28 years; April 14 to 24, 1896; Otit. med. chron. sup. sin.; headache on left side for some weeks.

Findings and Course—Somewhat unconscious, nystagmus, percussion sensitiveness on left half of head; pus in left ear; granulation above and behind; pulse 65; paralysis left facial. April 15th, temperature normal, pulse 58, somnolent, vomiting. April 17, operation left side; granulation in mastoid; caries of horizontal semicircular canal; operation interrupted by injury of sinus. April 19th, unconscious. April 21st, cerebellum incised, no pus. April 24th, death.

Autopsy—Left half of cerebellum adhering to temporal bone; after the dura was detached, a cerebellar abscess, size of walnut was opened; hydrocephalus internus; cerebellar abscess by involvement of equeductus vestibuli.

Fundus—April 14th, normal; borders of disc sharp; color and appearance of vessels normal (Prof. Burchardt).

Case 12. Anamnesis—A. L., 34 years; October 6th to 27th; Otit. med. chron. sup. sin.; great discharge.

Findings and Course—Dull headache in temple and forehead, no dizziness, Romberg—slight, fetid suppuration left ear, defect in drum. October 7th, operation left side; tegmen antri et tympani carious, also labyrinth, dura healthy. October 11th, vomiting, headache, dizziness, temperature 37°, pulse 54. October 13th, pulse 52; left pupil reacts slower than right, conscious. October 19th, left pupil larger than right. October 26th, pulse 58, delirium. October 27th, ptosis left side, twitching left facial, delirium; operation laying bare and incision left temporal lobe; dura not pulsating, not colored, no pus. Death few hours after operation.

Autopsy—Pia of base infiltrated with pus; cloudy fluid in ventricles.

Fundus—October 6th, fundi pale, normal. October 13th, normal. October 22d, normal. October 26th, normal.

Case 13. Anamnesis—F. L., 47 years; February 15 to 17, 1898: Otit. med. chronic. sup. dex.: two days before, suddenly, headache and pain in neck; brought to clinic in somnolent state.

Findings and Course—Somnolent, antero-posterior movements of head limited; pupils react slowly; no nystagmus, no paralysis; temperature 39° ; pulse 72; suppurating bone fistula behind right ear. February 15th, operation right side; sinus laid bare; walls much thickened, slightly bleeding on puncture; incised, no pus, stenosed in the neighborhood. February 16th, unconscious, temperature 38° , pulse 140. February 17th, death.

Autopsy—Right sinus transversus filled with purulent thrombi as far as the confluens sinuum; vena jug. free, arachnoidea of base and convexity infiltrated with pus.

Fundus—February 16th, fundi normal; borders of discs sharp.

Case 14. Anamnesis—F. S., 48 years; September 19, 1898; Otit. med. chron. sup. dex.

Findings and Course—Unconscious, pupils equal, paralysis left facial, death.

Autopsy—Dura over right tegmen antri discolored and perforated; abscess right temporal lobe.

Fundus—September 19th, normal.

Case 15. Anamnesis—H. M., 16 years; September 16 to October 6, 1898; Otit. med. chron. sup. sin.: three weeks ago aural discharge increased, headache.

Findings and Course—Apathetic, uncertain gait, headache, especially left side, dizziness, amnesic aphasia, pulse 48, much pus from left ear. September 17th, operation left side; mastoid full of granulations and pus, tegmen antri gone, dura thickened, puncture gives pus, opening of abscess of temporal lobe, from without; after operation, conscious, pulse 60. September 20th, sensorium free, aphasia still existing. October 2d, somnolent, pulse lengthened, evacuation three tablespoonfuls of pus. October 6th, death.

Autopsy—Dura of surface left pyramid adherent, brain degenerated over tegmen; abscess comprising entire left cerebral hemisphere, so that a brain mantle of only 3 cm. thickness remained; no sinus thrombosis.

Fundus—September 16th, right disc pale; left, tortuosity of veins, disc pale. September 20th, both sides normal.

Case 16. Anamnesis—M. M., 18 years: August 6 to 30, 1899; Otit. med. sup. chron. dext.

Findings and Course—Temperature, 38.7° , pulse 130, somewhat apathetic, severe headache, right mastoid sensitive to pressure, whole head to percussion; pupils equal, react; nystagmus; fetid suppuration right ear, total defect drum. August 10th, temperature 38.8° , pulse 120, right pupil larger than left; bulb, venae jug. dext. sensitive to pressure; Romberg positive; operation right side; cholesteatoma, in middle ear, recessus and antrum; puncture of cerebellar dura gives fetid pus; laying bare of cerebellum gives two tablespoonfuls of pus; after operation, temperature 37.2° . August 13th, right pupil larger than left, intense nystagmus; apathetic; dressing; much pus from cerebellar abscess; sinus partially discolored, no thrombus. August 16th, chill, vomiting; fever with typical pyemic course; varying consciousness; continual discharge of pus from cerebellum. August 30th, death.

Autopsy—In addition to abscess opened at operation there is a second one, size of cherry; right half of cerebellum adhering to region of sinus transv. and latter thrombosed.

Fundus—August 10th, right disc cloudy; borders indistinct, viens overfilled. Aug. 11th, disc has sharp borders. Aug. 21st, right disc cloudy; nasal border indistinct, viens very full.

Case 17. Anamnesis—C. B., 22 years; April 4 to May 8, 1899; Otit. med. chron. sup. dext.; since March 30th, headache, dizziness, vomiting.

Findings and Course—Temperature 39° , pulse 100, headache, very sick appearance, nystagmus toward right side; much discharge right ear, right drum bulging, with pulsating light reflex. April 5th, temperature 40.4° , chill, nystagmus toward right side. April 6th, operation right side, cholesteatoma, laying bare of sinus filled with disintegrating thrombus; after the operation, temperature 37.3° . April 17th, temperature 37° , pulse 70, condition good. April 26th, weak, headache, pulse 60, sensorium free. April 28th, opening of cerebellum from posterior cranial fossa: two tablespoonsful of pus. April 29th, pulse, temperature, normal; sensorium free. May 3d, apathetic. May 8th, unconscious, pulse 66, temperature 37° ; dressing, no pus, great tension of brain; laying bare and incision of cerebellum, no pus; death same day.

Autopsy—Purulent sinus thrombosis and right cerebellar abscess.

Fundus—April 5th, normal. April 26th, entirely normal. May 6th, right disc hyperemic. May 8th, neuritis optica dex.

Case 18. Anamnesis—E. H., 15 years; August 2 to 25, 1899; Otit. med. chron. sup. dex.; in the night from August 1st to August 2d, vomiting and chill.

Findings and Course—Anemic girl, very feverish; fetid pus from right ear, posterior meatal wall sunken. August 4th, chill, malaise. August 5th, malaise, nystagmus toward left; operation right side, pus and granulations in mastoid, sinus normal; temperature after operation, 36.7° . August 7th, sinus laid bare backwards, discolored, tamponade on account of hemorrhage. August 8th, slight icterus, nystagmus, chill. August 16th, dressing, region of bulb smeary, right pupil larger than left. August 21st, unconscious, ligation ven. jugul. August 22d, dressing shows pus; facial paralysis; coma; pus from bulb. August 28th, death.

Autopsy—Arachnoidea of base and right temporal lobe infiltrated with pus; icherous thrombus right sinus transversus into the bulbus ven. jugul.; inner side of dura of posterior cranial fossa infiltrated with pus.

Fundus—August 5th, normal. August 11th, veins very full, and tortuous, borders of discs sharp. August 21st, fundi normal.

Case 19. Anamnesis—F. S., 10 years; November 12, 1898, to March 4, 1899; Otit. med. sup. acuta sin.; discharge from left ear for 14 days.

Findings and Course—Temperature 37.7° , pulse 72, somewhat stupid, uncertain gait; Romberg positive, slight nystagmus, movements of head limited, dizziness, pus in left auditory meatus, drum red and protruding. November 16th, temperature 38° ; occiput painful; delirium; operation left side: evacuation of pus by puncture of cerebellum through the posterior cranial fossi; opening of cerebellum, evacuation of two tablespoonsful of pus; after operation sensorium freer. December 3d, during change of dressing, one teaspoonful of pus comes behind gauze; temperature normal. January 3d, out of bed. April 5th, discharged, cured.

Operation—Abscess left side of cerebellum.

Fundus—November 14th, border right disc indistinct, veins tortuous; left, veins tortuous. November 27th, bilateral hyperemia of fundus. December 3d, both fundi normal.

January 29th, same. July 8th, when patient returned to have wound looked at, fundi examined and found normal.

Case 20. Anamnesis—O. D., 15 years; June 13th to 27th, 1899; Otit. med. chron. sup. dex.; chill and pain on moving head, a few days before admission.

Findings and Course—Head bent towards right side, movement to left painful; total defect right drum, pus. June 18th, gait uncertain; operation on right, caries of tegmen tympani; sinus walls discolored, on opening blood and pus. June 21st, nystagmus. June 22d, slight edema of both lids. June 24th, apathetic; temperature 37.5° ; slight paresis of right abducens. June 25th, unconscious; ptosis left side; both lids edematous. June 27th, death.

Autopsy—Purulent thrombosis right sinus transversus extending into right sinus cavernosus and ven. jugul.; arachnitis purulenta circumscripta.

Fundus—June 17th, bilateral neuritis optica.

Case 21. Anamnesis—E. W., 39 years; September 20, to October 2, 1899; Otit. med. chron. sup. sin.; for four days pain in left half of head, fever, unintelligible speech.

Findings and Course—Apathetic; aphasic disturbances, pressure sensitiveness on left half skull, severe headache, fetid pus in left meatus; superior posterior wall protruding; defect in drum. September 21st, operation left side, granulations and pus in mastoid and middle ear; tegmen carious, dura discolored; laying bare and incision left temporal lobe, one teaspoonful of pus. September 21st, high temperature, aphasia unchanged. September 23, twitching muscles right side of face and right extremities; unconscious. September 24th, repeated convulsions. October 2d, death.

Autopsy—Abscessus lobi occipito-temporalis.

Fundus—September 20th, considerable distension veins both sides, otherwise nothing especial. September 26th, right disc shows indistinct borders, tortuous veins.

Case 22. C. Z., 30 years; September 23d to October 14, 1899; Otit. med. chron. sup. sin.; since August, 1898, ear affection; for some weeks dizziness, vomiting, fever, very emaciated.

Findings and Course—Greatly emaciated man; tuberculosis of lungs; temperature normal; Romberg positive; tendency to fall backwards; head not sensitive to pressure, foul pus in left meatus, total defect, labyrinth wall covered with smeary masses. September 30th, paresis left facial; nystagmus toward right side; speech indistinct. October 6th,

dysphagia. October 10th paralysis of taste on left side, hypalgesia left side. October 13th, somnolent. October 14th, death.

Autopsy—Abscessus cerebelli sin., arachnitis purulent. partialis regionis ossis petrosi sin. et chiasmat. nervorum II, phthisis pulmonum, great tubercular ulceration posterior surface velum palati, caries labyrinthine wall and facial canal. Tubercle bacilli never found in aural discharge.

Fundus—September 28th, both sides normal. October 14th, normal.

Case 23. Anamnesis—W. D., 25 years: December 20th to 21st, 1899; Otit. med. chron. sup. sin.; for four weeks swelling behind left ear, for three days vomiting.

Findings and Course—Very sick appearance; apathetic; diffuse swelling behind left ear, with fistula; temperature normal, pulse 60; fetid pus from stenosed left meatus; pupil reaction slow. February 21st, operation left side, uncovering cerebellum, dura tense, not pulsating; incision, no pus.

Autopsy—Cerebellar abscess left side; pachymeningitis externa in region of left temporal bone; operation incision $1\frac{1}{2}$ cm. in front of abscess.

Fundus—December 20, normal.

Case 24. Anamnesis—H. M., 18 years; Dec. 30, 1898, to Jan. 3, 1899; Otit. med. chron. sup. dext.; for fourteen days profuse aural discharge, pain in head and neck.

Findings and Course—Sideward movements of head painful; vomiting; defect right drum; fetid suppuration. December 31st, operation right side; pus in mastoid, sinus bathed in pus, walls thickened, not discolored; for two days chills, rise of temperature to 40° ; right pupil larger than left, not reacting. January 3d, death.

Autopsy—Purulent infiltration pia of base, pachymeningitis externa of region right temporal bone; perisinous suppuration right side.

Fundus—December 30th, right disc cloudy, borders indistinct, vessels very full; left side, same. January 2d, bilateral venous hyperemia (Brecht).

Case 25. Anamnesis—P. H., 38 years; September 20 to October 5, 1900; Otit. med. sup. acut. sin.; for four weeks, headache left side; for six days, fever, headache, malaise; three paracenteses.

Findings and Course—Looks very sick; temperature 39.2° ; severe headache; region behind left mastoid sensitive to pressure; no Romberg; no nystagmus, no paralysis; pupils

equal, react. September 26th, vomiting. October 1st, headache, no suspicious symptoms. October 3d, temperature 39.6°, slightly somnolent, pulse 120. October 4th, operation left side, pus from sinus, abscess in left shoulder joint. October 5th, death.

Autopsy—Left sinus transversus to junction with sinus, longit. filled with purulent thrombus, pus in meshes of arachnoidea of medial hemisphere.

Fundus—September 23d, normal. October 1st, normal.

Case 26. Anamnesis—W. P., 19 years; November 29 to December 23, 1900; Otit. med. sup. chron. sin.; headache three weeks, nausea, vomiting, dizziness.

Findings and Course—Very sick, percussion sensitiveness of left occiput; slight swelling and sensitiveness left mastoid; fetid pus in left meatus; temperature 37.8°, pulse 90. November 30th, operation left; cholesteatoma.; pus, perisin. abscess, sinus wall yellow discolored. December 2d, chill. December 4th, purulent thromb. removed from sinus. Until December 21st, high temperature, chill. December 21st, evacuation of a perisin. abscess. December 23d, death.

Autopsy—Purulent thrombosis left sinus transversus, metastatic lung abscess; extra-dural abscess of posterior cranial fossa discovered at operation.

Fundus—November 29th, normal.

Case 27. Anamnesis—C. G., 21 years; November 10 to 29, 1900; Otit. med. chron. sup. sin.; for some days fever, much suppuration.

Findings and Course—Left auricle directed forward, swelling as far as squamous part of temporal, fetid pus in left meatus, superior posterior wall bulging. November 14th, operation left; gran.; carious destruction. November 21st to 26th, high temperature, chill. November 26th, removal purulent thrombus from left sinus transversus. Death while unconscious, November 29th.

Autopsy—Purulent thrombus of left sinus transversus.

Fundus—November 10th, normal. November 26th, normal.

Case 28. Anamnesis—E. E., 14 years; September 11 to 13, 1900. Otit. med. chron. sup. dex.; for one week, headache, dizziness, fever, chill.

Findings and Course—Apathetic, some sobbing; temperature 38.5°, pulse 80; right pupil larger than left; paresis of right rectus internus; whole head sensitive to pressure; headache. September 12th, temperature 41.3°; apathetic;

right pupil reactionless; ptosis right side, right int. rectus paralysed; operation right side; cholea, tegmen carious; incision temporal lobe, $1\frac{1}{2}$ tablespoonfuls pus; after operation, conscious. September 13th, death.

Autopsy—Abscess in right temp. lobe of size of walnut; pus between dura and arachnoid of whole right hemisphere. Arach. infiltrated with pus.

Fundus—September 12th, bilateral neuritis optica.

Case 29. Anamnesis—Mrs. M., 33 years; August 20 to September 18, 1900; Otit. med. acut. sin.; for three weeks, discharge left ear, for some days, vomiting, headache.

Findings and Course—Edema left mastoid, left meatus swollen, posterior superior wall bulging; purulent secretion; drum red, bulging. August 22d, operation left side, granulations and pus in mastoid and antrum, sinus not discolored. August 29th, sinus incised, purulent thrombus. September 18th, discharged, improved.

Operation Findings—Purulent thrombosis left sinus.

Fundus—August 29th, myopic fundi; discs grayish white, not swollen, sharply defined from surrounding structures.

Case 30. Anamnesis—M. S., 22 years; March 6 to June 15, 1900; Otit. med. chron. sup. sin.

Findings and Course—Pain in left half of head, dizziness, Romberg very pronounced, no nystagmus, sensorium free, temperature 37.4° , pulse 96. March 8th and 10th, convulsions (patient has epilepsy). March 29, operation left side; granulations, caries in region facial spur.; headache after operation. April 30th, May 7th and 10th, convulsions. May 14th, persistent complaint of headache left side, clear intellect. May 15th, pronounced percussion sensitiveness on left side, beginning amnesic aphasia, some stupor. May 16th, operation left side; incision in left temporal lobe, no pus. May 23d, persistent, more or less pronounced somnolence. May 25th, increased temperature, delirium, pus from temporal lobe on change of dressing. May 29th, sensorium clearer, plain amnesic aphasia. June 2d, intellect clearer, aphasia less, serous fluid from wound in brain, temperature normal, pulse 72. June 9th, facial paralysis right side, pulse 56. June 13th, another incision into left temporal lobe, one tablespoonful of pus. June 15th, death.

Autopsy—Abscess size of apple in left temporal lobe; sinus, dura, tegmen antri et tympani and labyrinth intact.

Fundus—March 6th, normal. April 23d, normal. May 15th, normal. May 23d, neuritis optica incip. May 30th,

both discs cloudy, borders indistinct, slight swelling, veins tortuous, no hemorrhages, neuritis optica.

Case 31. Anamnesis—W. M., 30 years; July 11 to 21, 1900; Otit. med. chron. sup. bilat.; headaches for eight days, unconscious since yesterday.

Findings and Course—Temperature 38.9°, pulse 116, somnolent, hyperesthesia, head movements painful; large discharge both ears; left mastoid sensitive to pressure; plain torticollis, cutaneous reflex increased. July 13th, unconscious, torticollis. July 17th, right extremities paretic; operation left side, abnormal amount of pus on opening mastoid, tegmen carious; opening of abscess temporal lobe; after operation rise of pulse from 60 to 90; since operation unconscious. Death July 21st.

Autopsy—Abscess size of apple in left temporal lobe; thrombus in left sinus transversus.

Fundus—July 14th, both discs reddened; borders indistinct; veins overfilled.

Case 32. Anamnesis—E. N., 23 years, June 16 to July 10, 1900; Otit. med. acut. sin. For 1 week, discharge left ear, headache.

Findings and Course—Fetid pus from left meatus; post. wall bulging; June 22, temperature 39.8°; chill, headache, vomiting; mastoid sensitive to pressure; June 26, operation left side; cholest., gran., pus, external sinus wall destroyed; pus from sinus; June 30, sinus full of pus, at dressing. July 1, pus from bulbous v. jugul. July 10, death.

Autopsy—Pur. thrombosis of left sinus transv. from bulb to confluens sinuum, focus of pus, left side, between cerebellum and arachnoidea.

Fundus—June 24, normal.

Case 33. Anamnesis—H. B., 23 years; Jan. 21 to Apr. 4, 1900; Otit. med. chron. sup. dex.; for several days fever, chills, vomiting, dizziness.

Findings and Course—Tip of right mastoid sensitive to pressure; fetid pus right side; white masses in depth of ear; Jan. 22, chill; pain on pressure on throat on both sides; Jan. 26th, daily chills; no nystagmus; operation right side; cholest., sinus incised; non-purulent thrombus removed; perisin. abscess; Jan. 31, temperature normal since operation; icterus, pleuritis sinistra; Feb. 1, pus from bulb. v. jugul.; right v. jugul. thrombosed as far as thyroid cartilage, ligated and slit; two months later wound healed, patient discharged April 4.

Operation Findings—Purulent thrombosis of sinus transv. and bulbus v. dext.; perisin. abscess right side.

Fundus—Jan. 22, normal; Jan. 26, normal; Feb. 19, normal.

Case 34.—Anamnesis—W. J., 24 years; June 16 to 27, 1900; Otitis med. chron. sin.; for three weeks earache and pain in neck on movement.

Findings and Course—Fairly strong, head bent towards left; movements painful; fetid pus from left ear; defect drum; no vomiting; no dizziness; no headache; no nervous disturbances; June 19, operation left side; cavities mastoid and antrum filled with choles., gran., and pus; bare dura of m. cranial fossa unchanged; extradural pus in m. cran. fossa.; June 24, sleepy; Romberg positive; walk uncertain; nystagmus; June 25, stupor; operation left side; sinus slit for foramen jugul; pus in same; no improvement after operation; June 27, death.

Autopsy—Pia of right hemisphere and base of brain infiltrated with pus; sinus thrombosis left side; extradural abscess left side.

Fundus—June 19, normal.

Case 35. Anamnesis—P. R., 47 years; March 18 to 25, 1901; Otit. med. sup. chron. bilat.

Findings and Course—Strong; internal organs healthy; headache; both mast. somewhat sensitive to pressure; profuse discharge both sides, not fetid; no dizziness; no vomiting; temperature between 37.5° and 38° ; pulse 80; March 20, operation left side; choles., tegmen carious; normal temperature until Mar. 24; no complaints; Mar. 24, temperature 40.4° ; pulse 60; on change of dressing, normal dura in region of tegmen; somnolent in evening; vomiting; Mar. 25, death.

Autopsy—Abscess, size pigeon's egg in left temp. lobe; pus in left lateral ventricle and 4th ventricle; pur. infiltration of arachnoidea cerebelli; dura over left temp. bone infiltrated with pus; latter carious.

Fundus—Mar. 20, normal.

Case 36. Anamnesis—M. S., 12 years; Dec. 3, 1900 to Jan. 30, 1901; Otit. med. acut. sup. bilat.; for 3 days, swelling behind left ear.

Findings and Course—Left auricle stands out; much fetid pus both ears; gran. in depths; no headache; no nervous symptoms; internal organs healthy; Dec. 10, operation left side; choles.; tegmen perforated, dura bare; dura of post.

cranial fossa bare; Dec. 20, temperature normal; no complaints; wound looks well; pus in right ear; Jan. 16, operation right side; cavities filled with gran.; Jan. 25, rise of temperature; nystagmus; cervical pain on movement of head; Jan. 27, persistent vomiting; torticollis; headache; hyperesthesia; conscious. Lumbar puncture; cloudy, flocculent fluid, containing streptococci; Jan. 30, death.

Autopsy—Arachnoidea of base infiltrated with pus, especially in region of n. optici and medulla oblong.; cloudy fluid in ventricles; no thrombi in sinus; left temp. bone discolored at junction of petrous and squamous portions.

Fundus—Jan. 16, normal.

Case 37. Anamnesis—K. G., 20 years; Feb. 1 to 3, 1901; Otit. med. sup. chronic bilat. since middle of Jan.; headache; dizziness.

Findings and Course—Apathetic; headache; some torticollis; painful head movements; fetid pus from left ear; radical operation on right side; Feb. 3, death.

Autopsy—Purulent basilar meningitis; some hydrocephalus.

Fundus—Feb. 1, bilat. overfilling of vessels; no inflammatory changes.

Case 38. Anamnesis—A. J., 4 and one-half years; Feb 5 to May 1, 1901; Otit. med. acuta sin.; 12 days ago, sup. of left ear with chills and fever.

Findings and Course—Left auricle stands out; profuse pus from left meatus; drum bulging; Feb. 6, operation left side; gran. in antrum; evacuation of abscess between bone and dura of post. cranial fossa; left sided pneumonia in course of disease; May 1, discharged.

Operation Findings—Extradural abscess of left post. cranial fossa.

Fundus—Feb. 8, right disc, borders indistinct; hyperemia; left disc, hyperemia.

Case 39. Anamnesis—A. T., 35 years; July 17 to 20, 1901; Otit. med. chron. sup. bilat.; some days before admission, painful swelling in region of left ear, extending to the left side of neck; frequent vomiting, fever and chill.

Findings and Course—Very sick appearance; temperature 39.9°; pulse 98; sensorium free; percussion sensitiveness of head; left jaw angle and side of neck painful; defect of drums both ears; fetid sup. left ear; July 18, torticollis; swelling left side neck; temperature 41.1°; operation left side; cholest.; sinus wall thickened; non-purulent softened

thrombus removed from sinus; good condition after operation; July 19, headache; edema left lids; slight exophthalmus both sides, more on left; July 20, edema of lids, and exophthalmus, more on left side; unconscious; death.

Autopsy—Thrombosis of left sinus transv. and sinus cavernosus; arachnitis purulenta.

Fundus—July 17, normal.

Case 40. Anamnesis—B. S., 40 years; Aug. 10 to 13, 1901; Otit. med. sup. chron. dext; for some weeks, headache and dizziness.

Findings and Course—Very sick; temperature 38.7° ; pulse 120; right jaw angle and side of throat painful, as is movement of head; fetid discharge from right ear; Aug. 11, operation right side; gran. in antrum; tegmen carious; bare dura thickened; infiltrated with pus; puncture and incision of temp. lobe gives pus; Aug. 13, death.

Autopsy—Abscess of right temp. lobe; dura of m. cranial fossa covered with pus externally.

Fundus—Aug. 10, normal.

Case 41. Anamnesis—Mrs. L., 50 years; Nov. 25, 1901, to Feb. 14, 1902; admitted to internal clinic complaining of headache, vomiting, aphasic disturbances; pulse 48; sent to ear clinic.

Findings and Course—Pulse 56; left drum bulging; defect above, from which protrude white masses; Nov. 26, operation left side; choles., tegmen perforated; puncture through dura gives fetid pus; incision temp. lobe gives 4 tablespoonfuls pus; Nov. 27 aphasia better; Dec. 10, aphasic disturbances; Dec. 20, pus on change of dressing; pulse 60; paraphrasia; Dec. 29, paraphrasia; Jan. 20, left room first time; Feb. 14, discharged, cured.

Operation Findings—Abscess left temp. lobe.

Fundus—Nov. 23, normal; Nov. 30, borders left disc slightly indistinct; Dec. 24, left side plain choked disc, veins very tortuous, hemorrhages near disc; right side almost normal; Dec. 27, left side, choked disc less; hemorrhages still present; right side normal; Jan. 5, left side, hemorrhages increased; right side, spindle-shaped hemorrhage near border of disc; Jan. 27, left side, hemorrhage less; right side, unchanged; Feb. 14, borders of left disc not sharp; no swelling; right, normal.

Case 42. Anamnesis—F. E., 9 and one-half years; Sept. 8 to Nov. 9, 1903; Otit. med. sup. chron. bilat; several days ago, convulsions right half of body.

Findings and Course—Unconscious; nystagmus; fetid pus from stenosed, left meatus; drum red, swollen; Sept. 10, amnesic aphasia; paresis right facial nerve, and right arm; Romberg positive; Sept. 11, operation left side; gran. and pus; sinus and dura middle and post. cranial fossae lie bare, thickened; temp. lobe incised; 100 cm. pus; after operation aphasia and paresis arm improved; Sept. 24, headache, nystagmus. Sept. 25, headache, from the region behind the first abscess cavity comes pus; Oct. 8, evacuation of new pus from cavity in temp. lobe; Oct. 11, intelligence unimpaired, aphasia pronounced; Oct. 19, evacuation large amount pus from the abscess cavity; Oct. 24, medial from first cavity is a second, size of walnut; Oct. 29, temperature 40°; pulse 90; somnolent; Oct. 30, mydriasis right side; facial paresis; Nov. 8, death.

Autopsy—Abscess in left temp. lobe; very cloudy fluid in meshes of pia; in post. cranial fossa, 1½ tablespoonfuls of cloudy fluid.

Fundus—Sept. 10, borders of discs sharp, veins very full, tortuous, dilated; Sept. 12, right side normal; left side, fullness and tortuousness of veins; Sept. 24, left side moderately choked disc; vessels bent; tortuous, very full; Oct. 11, left side choked disc increased; right side, borders of disc sharp, inferior veins tortuous; Oct. 19, left choked disc increased; right side, choked disc has developed; Oct. 31, bilateral choked disc; Nov. 2, bilateral choked disc, left side greater.

Case 43. Anamnesis—Mrs. M., 36 years; Sept. 7 to 12, 1903; Otit. m. sup. chron. dext.

Findings and Course—Pain in neck on movement of head; temperature 39.9°; thick pus in right meatus; Sept. 7, operation right side; large choles. that has ulcerated lateral and post. semicircular canals; dura of mid. and post. cranial fossa normal; sinus normal; puncture of dura gives no pus; lumbar puncture; in fluid clots, leucocytes and diplococci; Sept. 11, lumbar puncture, almost pure pus; Sept. 12, death.

Autopsy—Meningitis purulenta.

Fundus—Sept. 7, normal; Sept. 8, normal borders, no hyperemia.

Case 44. Anamnesis—R. K., Jan. 29; Otit. m. sup. chron. dext.; several days before admission, pain in right ear; swelling behind it; dizziness and chill.

Findings and Course—Right auricle stands out; edema over right squama temporalis; right lower jaw angle and

mast. painful; Jan. 29, operation, right side; opening of large extradural abscess of mid. cranial fossa; puncture of temporal lobe gives no pus; Jan. 30, dizziness on sitting up, nystagmus.

Operation Findings—Extradural abscess of right middle cranial fossa.

Fundus—Jan. 29, normal.

Case 45. Anamnesis—R. L., 26 years; Feb. 11 to 18, 1904; Otit. m. chron. sup. dext.; chill shortly before admission.

Findings and Course—In right meatus, pur. secretion; swelling behind right auricle; Feb. 11, operation, right side; bone sclerotic, hyperemic, pur. thrombus removed from sinus after previous ligation of v. jugul.; Feb. 13, pain in left knee and shoulder joints; Feb. 16, unconscious; Feb. 18, death; temperature throughout, feverish, going as high as 40°.

Autopsy—Pur. sinus thrombosis right side; pur. infiltration of pia over velum medul. ant.; pia of convexity diffusely cloudy; fluid in lat. ventricles; benign thrombus in right sinus petrosus superficial.

Fundus—Feb. 16, normal (v. Haselberg).

Case 46. Anamnesis—Mrs. B., Dec. 19, 1903, to Jan. 26, 1904; Otit. med. sup. chron. dext.; for some days vomiting, headache, chills.

Findings and Course—Very sick aspect; pain on right side neck; headache; dizziness; Romberg positive; soft parts over right mast. infiltrated; right side neck like a cord; Dec. 19, operation, right side; pus in mast.; sinus wall, yellowish discolored, necrotic, removal of thrombus from sinus after ligation of v. jugal.; perisin. sup. Dec. 24, condition good. Jan. 26, discharged.

Operation Findings—Purulent sinus thrombosis left side; perisin abscess.

Fundus—Dec. 19, normal (before operation). Feb. 24, normal.

Case 47. Anamnesis—M. B., 48 years; Jan. 13 to Feb. 21, 1904; Otit. med. acut. sup. dext.; 8 days before, pain in right ear, after operation on nose; dizziness since yesterday.

Findings and Course—Pressure sensitiveness on right mast.; in right meatus is non-fetid pus; drum swollen, indistinct; paracentesis; Jan. 25, operation, right side; bone hyperemic, pus and granulat. after chiseling; sinus blue, injured in removal of gran.; great hemorrhage; dura of m.

cran. fossa healthy; Jan. 30, normal temperature; Feb. 4, headache; temperature 39°; during change of dressing, sinus seems discolored at one place; Feb. 5, pus comes from region of bulb. v. jugul.; ven. jugul. ligated; Feb. 20, coma; lumbar puncture gives a clear fluid under increased pressure; punct. of cerebellum and temp. lobes give large amount liquor cerebrosinalis; Feb. 21, death.

Autopsy—Pur. thrombus in bulb. ven. jugul., and uppermost part of v. jugul.; large amount clear fluid between meshes of pia, edema of pia; swelling of spleen with pur. metastases.

Fundus—Jan. 14, both papilla hyperemic, temp. borders indistinct (v. Haselberg); Feb. 2, neuritis optic. bilat. incip.; Feb. 6, neuritis opt. bilat. Feb. 19, same (right more pronounced).

Case 48. Anamnesis—W. R., 28 years; Dec. 28, 1903, to Jan. 15, 1904; Otit. med. chron. sup. dext.

Findings and Course—Tuberc. of larynx; otitis probably of tuberc. origin; two perforations in right drum; Dec. 29, mastoidectomy, antrotomy; on account of chill, sinus laid bare Dec. 30, without any result; Jan. 5, incision of sinus after ligat. of v. jugul.; sinus found thrombosed towards bulb; sent to internal clinic.

Operation Findings—Thrombosis right sinus.

Fundus—Jan. 15, both sides normal.

Case 49. Anamnesis—A. P., 10 years; Jan. 10 to Mar. 7, 1903; Otit. med. sup. acut. sin.; three weeks ago, pain in left ear after inflammation of throat.

Findings and Course—Anemic, venous noises, left mast. sensitive to pressure; pupils equal, react; no nervous symptoms; no nystagmus; paracentesis gives thick pus; temperature normal; pulse 80; no torticollis; Jan. 11, good condition; lumbar puncture; fluid clear and pressure not increased; Jan. 12, temperature 37°; pulse 70; good condition; Jan. 13, same, paracentesis; Jan. 14, nausea, some dizziness; pulse 54; operation left side; during narcosis, pulse 48 to 56, afterwards 60; torpid gran.; free pus, sinus wall not carious; thrombus found by puncture; same removed after ligation of v. jugul.; Jan. 17, pulse normal; Mar. 1, condition good, wound almost healed; Mar. 7, discharged, improved.

Operation Finding—Sinus thrombosis left side.

Fundus—Jan. 11, bilateral choked disc, veins widened and tortuous, partially disappearing at border of protruding disc (v. Haselberg); Jan. 12, same; Jan. 14, choked disc increased

on both sides; veil over veins; no hemorrhages; Jan. 17, same; Feb. 2, left side; hemorrhage, size of head of needle, at border of disc; bilaterally, striae of retina around disc; Mar. 7, choked disc both sides; prominence of disc, right side, 1-2 D; left side, 2-3 D.

Case 50. Anamnesis—F. N., Jan. 25 to Feb. 22, 1903; Otit. med. sup. chron. sin.

Findings and Course—Edema and pressure sensitiveness of left mast; profuse non-fetid sup. left ear; defect in drum; Jan. 26, operation, left side; gran., pus; pus from post. cran. fossa; sinus unaltered; Jan. 27 to Feb 5, erysipelas of right arm; Feb. 5, operation, left side; sinus discolored at one place, covered with gran.; operation stopped by hemorrhage; Feb. 8, sinus looks well on change of dressing; Feb. 19, temperature 38.7° ; edema of left squama, no Kernig nor Trousseau, no torticollis; operation, left side; discolored thrombus removed from sinus; Feb. 20, paraphasia; Feb. 22, weak; icterus, Kernig positive; Feb. 23, death.

Autopsy—Pur. sinus thrombosis left side; pur. infiltration of pia of left hemisphere; inner surface of dura shows numerous deposits; extradural abscess of post. fossa found at operation.

Fundus—Jan. 25, normal; Feb. 20, normal.

Case 51. Anamnesis—E. A., 25 years; Jan. 22 to Feb 8, 1903; Otit. m. chron. sup. sin.

Findings and Course—Temperature 39° ; chill; Jan. 24, operation left side; gran in mast.; Feb. 1, amnesic aphasia; Feb. 2, operation left side; removal of roof of m. cran. fossa; pus between bone and dura; puncture of discolored, softened dura gives fetid pus; opening of abscess of temp. lobe; Feb. 6, somnolence; Feb. 7, paresis right facial, right arm and leg; Feb. 8, death.

Autopsy—Abscess left temp. lobe size of hen's egg; extradural pus in m. cranial fossa.

Fundus—Jan. 22, normal; Feb. 2, both sides normal (v. Haselberg); Feb. 6, normal (v. Haselberg); Feb. 7, normal.

Case 52. Anamnesis—W. B., 14 years; Nov. 4, 1902, to Jan. 4, 1903; Otit. med. sup. chron. bilat; 18 days ago mastoidectomy on account of swelling behind right ear.

Findings and Course—Right side, total defect of drum; head movements free; Nov. 6, operation right side; choles., smeary granul.; sinus incised; removal of partially decomposed thrombus; ligation of v. jugul.; Nov. 14, no Kernig, no torticollis; Dec. 8, diffusely clouded fluid under increased

pressure obtained by lumbar puncture; some leucocytes; Dec. 16, sleepy, headache, no Kernig, no torticollis; Dec. 30, unconscious, Kernig positive, plain torticollis; Jan. 3, death.

Autopsy—Meningitis purulenta; pyocephalus.

Fundus—Nov. 5, beginning neurit. opt. sin; right side dilated veins; Nov. 12-14, bilat. neurit. opt., more on right side (v. Haselberg); Nov. 19, left disc swollen, borders entirely disappeared, vessels tortuous, right temp. border fairly distinct, others indistinct; Dec. 8, bilat. neurit. opt.; Dec. 16, bilat. neurit. opt.; Dec. 30, same.

Case 53. Anamnesis—W. K., 44 years; May 5 to July 23, 1903; Otit. med. acut. dext.; for three weeks discharge from right ear; for three days headache, swelling over right squama.

Findings and Course—Right half of head sensitive to pressure, edematous; right drum red and thick; May 6, operation, right side; pus in region of mid. and post. cran. fossae; dura here covered with gran.; pus near sinus, sinus filled with thrombus; July 23, discharged.

Operation Findings—Extensive extradural abscess of mid. and post. cran. fossae; non-purulent sinus thrombosis.

Fundus—May 5, left disc distinct; right disc, nasal border, slightly indistinct.

Case 54. Anamnesis—A. S., 13 years; June 4 to July 1, 1903; Otit. med. chron. sup. dext.

Findings and Course—June 5, operation, right side, sinus wall and cerebellar dura discolored in places; thrombus removed from sinus which was not entirely obstructed; July 1, discharged.

Operation Findings—Sinus thrombosis, right side.

Fundus—June 4, both sides normal.

Case 55. Anamnesis—R. H., 15 years; June 5, to July 21, 1903; Otit. m. acut. sin; headache for several days.

Findings and Course—Pale boy; headache left side; left side of head sensitive to percussion, left mast. to pressure; pupils equal, react.; no nervous symptoms; temperature 40° ; pulse 120; June 6, operation left side; pus in post. cran. fossa; sinus wall covered with gran., sinus filled with thrombi to the confluens sinuum; June 7, temperature 38.8° ; pulse 108; June 11, temperature 39° ; wound doing well; July 22, discharged.

Operation Finding—Sinus thromb. left side, extra-dural abscess post. cranial fossa.

Fundus—June 5, great hyperemia of both discs, borders

not clear; June 10, same; June 23, bilateral mild neurit. opt. (v. Haselberg); July 16, borders of right disc indistinct, nasal border, left disc, indistinct; same finding on exit, July 22.

Case 56. Anamnesis—E. F., 24 years; April 28 to May 26, 1903; Otit. med. chron. sup. bilat.

Findings and Course—Temperature 39° ; pulse 56; right mast. sensitive to pressure; Apr. 26, operation right side; sinus incised after ligation of v. jugul, dirty yellow thrombus removed; May 1, apathetic; pulse 52; May 2, pulse between 50 and 60; May 16, pulse 80; patient stood up for first time; May 26, discharged.

Operation Findings—Sinus thrombosis right side.

Fundus—Apr. 20, both sides normal (before operation). May 2, normal.

Case 57. Anamnesis—F. M., 28 years; Sept. 1 to Oct. 16, 1903; Otit. med. sup. acut. dext.; for 5 days, fever, swelling of region behind right ear.

Findings and Course—Edema of region of right mast. and squama; head movements free, no Kernig, no Romberg; much pus from right ear; Sept. 2, operation right side; gran., sinus wall thickened; after ligation of v. jugul, decomposed thrombus removed from sinus; Oct. 16, discharged.

Operation Findings—Thrombosis of right sinus.

Fundus—Sept. 1, entirely normal; Sept. 5, normal.

Case 58. Anamnesis—C. H., 48 years; May 19 to July 9, 1903; Otit. m. acut. sup. dext.; dizziness for 14 days.

Findings and Course—Very sick appearance, some nystagmus, right meatus stenosed, non-fetid pus; May 20, operation right side; gran., sinus and dura of mid. and post. cran. fossae laid bare, normal; puncture of dura yields liquor cerebrospinalis; after operation, pulse 44; May 25, good condition, pulse 64; June 1, pulse 64; June 2, temperature 38.2° , pulse 120; apathetic; June 3, operation, right side; thrombus in sinus, bulb v. jug., and beginning of v. jug.; July 9, discharged.

Operation Findings—Thrombosis of right sinus.

Fundus—May 22, normal.

Case 59. Anamnesis—Mrs T., 31 years; Jan 24 to May 20, 1903; Otit. m. sup. chron. bilat.

Findings and Course—Jan. 25, operation right side; ligation of v. jug.; removal of thrombus from sinus; Jan. 31, operation, removal of sup. thrombus from bulb; Feb. 3,

pyemic fever; Feb. 16, entire sinus laid bare; thrombus removed; May 21, discharged.

Operation Findings—Purulent thrombus right sinus.

Fundus—Mar. 2, normal.

Case 60. Anamnesis—P. W., 15 years; Feb. 18 to Mar. 15, 1903; Otit. m. chron. sup. sin.; exacerbation of the otitis 8 days ago.

Findings and Course—Temperature 39.6°; pulse 120; pain on pressure over the left mast. and region of left v. jug.; Kernig indicated; pus from left meatus; drum reddened, swollen; sensorium free; Feb. 18, operation left side; little pus in mast.; sinus covered with discolored gran.; after ligation of the v. jug., removal of pur. thrombus from sinus; **Feb. 22**, temperature 40°; lumbar puncture gives a cloudy fluid under increased pressure, containing streptococci; severe icterus, spleen increased, mild torticollis; Mar. 5, death.

Autopsy—Purulent thrombus left sinus; meningitis purulenta of base of brain; hydrocephalus.

Fundus—Feb. 18, normal; Feb. 22, normal; Feb. 26, normal.

Case 61. Anamnesis—M. H., 27 years; Mar. 12 to 15, 1903; Otit. med. chronic sup. dext.

Findings and Course—Nystagmus, Romberg positive, dizziness, vomiting, headache, stenosis of right meatus, post. wall sagging; Mar. 13, operation, right side; choles., gran.; sequestrum of part of the lateral and post. semicircular canals; sinus unchanged; on the dura of cerebellum, gran.; puncture gives no pus; Mar. 15, puncture of cerebellum gives pus; abscess opened; death on same day.

Autopsy—Abscess of right half cerebellum; its arachnoidea adhering to the dura; cranial wound rounded off; no thrombus.

Fundus—Mar. 12, nasal border of disc indistinct; veins dilated, and on the right side tortuous; Mar. 14, nasal borders of both discs indistinct (v. Haselberg).

Case 62. Anamnesis—J. T., 24 years; Sept. 22, 1902, to Jan. 9, 1903; Otit. m. chron. sup. sin.; headache for 3 days.

Findings and Course—Temperature 38.7°; fetid discharge left side; upper meatus wall hangs down; Sept. 24, temperature 39°; left mast. sensitive to pressure; somewhat stupid; pulse 60; pain in neck on movement of head; Sept. 25, temperature 38.2°; headache; pain in neck more severe; lumbar puncture; pressure increased; fluid diffusely cloudy; Sept.

25. operation, left side; antrum and m. ear full of gran.; tegmen not carious, dura of m. cranial fossa not pulsating, otherwise normal; puncture of temp. lobe; no pus; Sept. 26. headache, torticollis, and positive Kernig; Oct. 4. lumbar puncture, fluid diffusely clouded; Nov. 1. lumbar puncture, slightly cloudy fluid, containing numerous leucocytes and encapsulated diplococci; Nov. 14. Kernig very distinct; Trousseau present; Dec. 17. no dizziness; Jan. 9. 1903. discharged.

Operation Findings—Meningitis purulenta (?).

Fundus—Sept. 22. normal; Sept. 24. veins more filled than on 22; Sept. 26. veins very full; Sept. 28. veins very full, disc sharply defined; Oct. 17. normal; Oct. 20. normal; Nov. 17. normal (v. Haselberg).

Case 63. Anamnesis—H. G., 26 years; Feb. 25 to Mar. 11, 1903; Otit. m. acut. sup. dext.; about the middle of Feb., pains in right ear and mastoid paracentesis.

Findings and Course—Region of right mast. swollen; sensitive to pressure; pupils equal, react; pus in right meatus; post. super. wall sags; no nervous symptoms; Feb. 26. operation, right side; gran.; free pus; pus in post. cranial fossa; Mar. 10. discharged.

Operation Findings—Extradural abscess of post. cranial fossa.

Fundus—Feb. 25. sharply defined discs on both sides.

Case 64. Anamnesis—A. W., 17 years; Jan. 24 to 26, 1903; Otit. m. chron. sup. bilat.; brought to clinic unconscious.

Findings and Course—Temperature 40° ; unconscious; jaw muscles tensed; slight torticollis; pus in both meati; left drum greatly inflamed; Jan. 26. death.

Autopsy—Meningitis of convexity, of frontal lobe and base; hydrocephalus of ventricle; several spots of caries of temporal bone.

Fundus—Jan. 24. bilateral choked disc; discs hyperemic veins full and bent.

Case 65. Anamnesis—F. P., $3\frac{1}{4}$ years; April 15. to 18, 1902; Otit. med. sup. chron. bilat; lately vomiting; grasps at the right side of head with hand; convulsions of left half of body.

Findings and Course—Pale child, comatose; Cheyne-Stokes respiration; lumbar puncture; clear fluid with clots containing pus corpuscles; April 15. operation, right side; purulent gran. in mast. and m. ear; dura healthy externally;

puncture, blood fluid with flocculae; April 16, 2nd operation, right side; hyperemia of pia, thickening of dura; April 17 and 18, convulsions; April 18, death.

Autopsy—Meningo-encephalitis multiplex: meningitis hemisphaer. dext.: pachymeningitis interna hemorrhagica purulenta: caries ossis petrosi.

Fundus—April 15, normal. April 16, normal.

Case 66. Anamnesis—H. O., 13 years; Feb. 3, 1900, to Jan. 21, 1901: Otit. m. chron. sup. sin. with acute exacerbation: headache for 8 days, especially of left side of head: sleepy.

Findings and Course—Delicate girl, weak, temperature 37.5°; pulse 78; Romberg negative; left mast. sensitive to pressure; left auricle stands out; pus in left meatus; post. sup. wall sags; Feb. 7, operation, left side; choles.; tegmen carious; Feb. 10, evening rise of temperature; apathetic; Feb. 13, sleepy, vomiting, pulse 54; aphasic symptoms; operation left side; evacuation of abscess in temp. lobe.; pulse before operation 52, afterwards 80; Feb. 14, aphasia less, apathetic; Feb. 20, apathetic; Feb. 21, evacuation of pus; Mar. 9, patient freer, sits up in bed; Mar. 12, somewhat, pale, slight bilateral ptosis, aphasia increased; Apr. 9, condition good; July 16, nervous findings; irritative discondition of brain, objective symptoms of local brain disease not present; wound normal; Jan. 20, discharged.

Operation Findings—Abscess of left temp. lobe.

Fundus—Feb. 13, bilat. choked disc; Feb. 19, both discs cloudy, borders indistinct, veins tortuous, thin arteries in places hidden by edema of discs, left more so; retina near disc slightly cloudy; Mar. 9, bilat. choked disc felt more pronounced; Mar. 14, discs yellowish red, borders indistinct, veins tortuous, swelling of discs, 1½-2 D.; Apr. 6, same; May 23, choked disc seem receding; June 21, no swelling of disc, hyperemia, borders somewhat indistinct; Nov. 3, discs still cloudy.

Case 67. Anamnesis—E. S., 23 years; Feb. 12 to Aug. 3, 1898; Otit. med. chron. sup. sin.

Findings and Course—Complains of dizziness, foul pus in left meatus; Mar. 1, operation left, gran. in antrum and m. ear, antrum wall carious; Mar. 3, normal temperature and pulse, good condition; Mar. 6, temperature 39.5°; pain in head and neck, vomiting; Mar. 7, pulse 68; Mar. 24 and 25, April 8 and 9, chills; Apr. 21, headache, dizziness; Apr. 29, vomiting, headache; May 1, repeated vomiting, pulse 58, 60.

headache, apathetic; May 6, somnolent; May 7, abducent paralysis left side; delirium; May 8, operation left side; evacuation of cerebellar abscess, conscious after operation; May 9, sensorium free, abducens paralysis somewhat receded; May 11, paralysis gone; May 30, out of bed; cerebellar wound healing; Aug. 3, cured, discharged.

Operation Finding—Cerebellar abscess.

Fundus—Mar. 28, normal; Apr. 28, entirely normal, fundus pale; May 6, neuritis optica bilat.; discs swollen, borders indistinct, veins tortuous; May 11, neuritis left side same amount, right side somewhat less; May 26, right side radiate marking of disc; swelling (2 D.), edema of retina, veins very tortuous, arteries narrow, punctiform hemorrhages left side, slight changes; June 13, both discs redder than normal; borders indistinct; no swelling; vessels of normal contents.

Case 68. Anamnesis—A. L., 25 years; Jan. 8, to Feb. 8, 1903; Otit. med. chron. sup. sin.; since the end of the last month, headache, dizziness, vomiting, aphasia.

Findings and Course—Very sick, apathetic, distinct amnesic aphasia, sensitive on percussion on left half of head; fetid pus from left ear; meatus stenosed, drum red and swollen; operation, left side; choles.; sinas and semicircular canals involved; tegmen antri fistulous; puncture of temp. lobe gives pus; evacuation of abscess in temp lobe; Jan. 9, vomiting, Kernig positive, apathetic; Jan. 10, evacuation of pus, restless, vomited, pulse 60; Jan. 12, aphasia, sleepy, pulse 60; Feb. 3, unconscious, Kernig positive, opisthotonus, pulse 60, exophthalmus; Feb. 8, death.

Autopsy—Abscess of left temporal lobe; meningitis purulenta.

Fundus—Jan. 8, both sides normal (v. Haselberg). Jan. 10, normal; Jan. 21, normal; Feb. 3, normal (v. Haselberg).

Case 69. Anamnesis—W. H., 51 years; December 30, 1902, to January 16, 1903; Otit. med. sup. chron. sin.

Findings and Course—Headache, fetid pus from left ear.

January 7th, operation left side; granulations, much free pus. January 9th, temperature 38.8° , pulse 100, Kernig positive, torticollis, Trounseau; lumbar puncture, diffusely clouded fluid containing leucocytes and encapsulated diplococci. January 10th, Kernig and torticollis greater. January 16th, death.

Autopsy—Purulent infiltration of arachnoidea of brain

and cord; purulent fluid in ventricles; brain without focal disease.

Fundus—January 10th, normal (v. Haselberg). January 11th, normal.

Case 70. Anamnesis—H. N., 13 years; Feb. 25 to June 25, 1903; Otitis, med. sup. chron. dext., for 14 days; headache, vomiting, dizziness.

Findings and Course—Somnolent, monotone speech, right half of head sensitive to percussion; right mast. painful, temperature, normal; pulse 80; Feb. 27, operation right side. Thickening of mucous membrane; sinus and dura normal; Mar. 2, lumbar puncture: fluid diffusely clouded; speaks in distinct monotone, sleepy, Kernig, torticollis not present; Mar. 7, operation, puncture of cerebellum gives pus, evacuation of cerebellar abscess; Mar. 11, speech almost normal; Mar. 27, leaves bed for first time; Apr. 26, good condition; June 25, discharged.

Operation Findings—Cerebellar abscess.

Fundus—Borders of left disc indistinct, right shows great hyperemia, filling and tortuosity of veins; Mar. 2, same; Mar. 10, veins on right side fuller, otherwise same; Mar. 13, borders somewhat hazy, veins dilated, not tortuous; Apr. 27, slight cloudiness over discs.

Case 71. Anamnesis—M. S., 20 years; Oct. 18, 1898 to Jan. 31, 1899; Otit. med. sup. chron. dext.; on Oct. 15, acute exacerbation, with fever, chill, vomiting, headache.

Findings and Course—Temperature 40°; pulse 80, very sick, fetid pus from right ear; Oct. 19, operation right side; gran., pus, sinus wall thickened, discolored; Oct. 20, high temperature, vomiting, headache; Oct. 23, swelling of left wrist joint; on dressing, find perisin. pus, wound normal though with pyemic symptoms; Jan. 30, discharged.

Operation Findings—Extradural abscess of post. cran. fossa.

Fundus—Oct. 18, normal; Oct. 23, veins on left side fuller than on right.

Case 72. Anamnesis—B. S., 2½ years; Jan. 30, 1904; Otit. med. acuta sin.

Findings and Course—Anemic; left auricle stands out, left meatus stenosed, superior posterior wall sags; Feb. 1, operation, left side, cavity full of gran.; ext. wall of ascending part of sinus affected, sinus filled with purulent thrombus, ligation of v. jugul.; Feb. 2, knee of sinus full of pus, sinus laid bare far posteriorly, thrombus removed; Feb. 6, normal

temperature; Feb. 10, sits up in bed; Feb. 24, lumbar puncture, clear fluid; Feb. 26, wound in cranium granulating normally; wound course normal; still under treatment.

Operation Findings—Purulent thrombus of left sinus.

Fundus—Feb. 4, normal (v. Haselberg); Feb. 26, normal.

Case 73. Anamnesis—P. N., 11½ years; Dec. 12, 1903, to Jan. 10, 1904; Otit. med. chron. sin.; 14 days ago, severe pain, left side; simultaneously swelling behind left ear.

Findings and Course—L. auricle stands out like a wing; fetid, pus from left meatus, which is stenosed to a slit; gran. in depths, distinct nystagmus towards left side; nervous system normal; Dec. 15, operation; gran., choles., sinus unaltered, extradural pus from post. cranial fossa; Dec. 30, condition good; patient out of bed; Jan. 10, discharged.

Operation Findings—Extradural abscess of post. cranial fossa.

Fundus—Both sides normal.

Case 74. Anamnesis—W. D., 41 years; Mar. 28, to Apr. 16, 1901; Otit. med. sup. acut. dext., since end of Feb. swelling behind right ear.

Findings and Course—Right auricle stands off; dull feeling in head, temperature normal; Mar. 29, operation; smeary gran. and pus in mast., sinus laid bare, thick walls slit, non-purulent thrombus removed; normal temperature; Apr. 16, discharged.

Operation Findings—Sinus thrombosis, right side.

Fundus—Mar. 28, normal.

Case 75. Anamnesis—C. N., 10 years; Apr. 18 to May 18, 1903; Otit. med. acute, sin.

Findings and Course—Left auricle stands off, swelling of soft parts behind, no cord formation, no pressure sensitivity of left side neck; movements of head free, much non-fetid pus from left meatus; April 20, operation, left side; gran. in mast., perisin. pus, sinus covered with gran., in places yellowish discolored, contents normal; Apr. 24, out of bed; wound normal; May 18, discharged.

Operation Findings—Perisinous abscess, left side.

Fundus—Apr. 18, normal.

Case 76. Anamnesis—S. G., Dec. 18, 1902, to Jan. 15, 1903; Otit. med. sup. acut. sin.

Findings and Course—Swelling over left mast.; pain on pressure, no cord formation along v. jug., head movements free; pus in left meatus; Dec. 21, operation, left side, gran.,

sinus bare in part, extradural abscess of m. cran. fossa; Jan. 15, discharged.

Operation Findings—Extradural abscess of m. cran. fossa.

Fundus—Dec. 18, normal.

To obtain an idea of the frequency of pathologic changes on the fundi in otogenous intracranial diseases, I will compare the cases without findings with those where there were lesions of the fundus. In doing this, I have separated the cases with only one intracranial disease from those where several intracranial structures were involved. It is evident that the former would give a clearer picture of the relation between intracranial disease and opticus lesions. In collecting the cases with several diseases, that one would naturally rank as antecedent which caused the opticus lesion.

CASES WITH ONE DISEASE.

Fundus Oculi.

Diseases.	Normal.	Abnormal
Extradural abscess	5, (44, 63, 73, 75, 76)	2, (38, 41)
Leptomeningitis purul	4, (12, 36, 43, 69)	4, (37, 52, 62, 64)
Sinus thrombosis	10, (27, 29, 48, 54, 56, 57, 58, 59, 72, 74)	2, (47, 49)
Cerebral abscess	4, (9, 14, 30, 40)	1, (15, 21, 41, 66)
Cerebellar abscess	1, (11)	1, (2, 19, (7, 79)
49	24	66

CASES WITH SEVERAL DISEASES.

Extradural abscess		1, (74)
Leptomeningitis purul	2, (7, 65)	
Sinus thrombosis	16, (1, 4, 6, 8, 10, 13, 25, 26, 32, 33, 34, 39, 45, 47, 50, 60)	4, (7, 48, 50, 55)
Cerebral abscess	3, (35, 51, 68)	4, (28, 31, 42)
Cerebellar abscess	2, (22, 23)	5, 3, 16, 17, 28, 61)
36	23	13
76	47	29

Since, however, when there is a simultaneous presence of several intracranial complications, it would naturally be difficult to decide which part of which one was to be taken

as the cause of the fundal changes, I have chosen that one which either clinically or pathologico-anatomically stood in the foreground, and which was capable of causing ocular changes.

We see that changes on the fundus are present in every form of intracranial disease, but that they frequently fail in our cases. A preponderance of normal findings over pathological, under similar conditions, is noted also by Hansen and Koerner in their investigations. The latter more frequently found lesions in the combined intracranial diseases than in the simple, something that is not confirmed by us. We find that the changes in the simple and combined are about equally frequent. The following is an analysis of the fundal changes in the different kinds of intracranial complications:

1. Extradural Abscess.

This was found 7 times as the single, otogenous, intracranial complication, 6 times in the posterior and 1 in the middle cranial fossa; accompanied by other complications, it was found 12 times, 3 times in the middle cranial fossa, and 9 times as a perisinous suppuration. Altogether, it was found 19 times.

In these 19 cases, the fundus was 14 times normal and 5 times abnormal. Twice the changes accompanied simple extradural abscesses (38, 71), 3 times combined affections (24, 53, 55). In both simple forms, the changes were of the mildest character; in case 38, there was a bilateral hyperemia of the fundus, on the right side indistinctness of the disc's borders; in case 71, there was at one time a difference in the amount of blood in the veins. In the first case, the changes were discovered 2 days after the abscess was opened; unfortunately, the findings before the operation are not known; at any rate, the changes did not disappear immediately after the operation. Among the three abscesses combined with other intracranial diseases, one, Case 53, is noteworthy; in this case there was an extradural collection of pus of unusual amount; it extended over the middle and posterior cranial fossae of the right side and was under increased pressure, as the operation showed. The abscess was combined with a nonpurulent sinus thrombus, which was probably caused by the pressure of the pus in the posterior fossa on the sinus. In this case also, (the

examination was made a day before the operation), the fundal changes were very slight in spite of the increased intracranial pressure. On the side of the healthy ear, the fundus was normal; on the side of the ear and brain disease, the disc was indistinct nasally; the post-operative examination is absent. In 24 and 25, the symptoms of the extradural suppuration were obscured by the other cranial effects present at the same time. In the cases in our list the fundal changes occurring with extradural abscesses are very rare and very mild. Hansen and Koerner found the same.

2. Leptomeningitis Purulenta.

In no other of the otogenous intracranial complications are there so many differing views of the appearance of the fundus as in the otogenic purulent meningitis.

Zaufal¹ found the neuritis optica so constant in otogenic meningitis that he differentiated this form from other forms of meningitis by the presence of the opticus affections.

Kneiss² considered the presence of neuritis optica as the greatest diagnostic aid for purulent leptomeningitis. On the other hand, Pitt³ believed that opticus changes are always absent in uncomplicated otogenic leptomeningitis purulenta. Among Hansen's cases, the number with optic nerve changes were slightly in excess of those without; Koerner found in 6 uncomplicated cases only normal fundi, of 8 cases combined with other disease 2 had normal fundi and 6 showed changes.

In our 76 cases, purulent leptomeningitis was present 31 times, either as a single intracranial disease or associated with another, sometimes as the chief disease, sometimes as a disease of little importance. 11 of these 31 cases, that is about one-third, showed fundal changes. Of the 8 simple cases, 4 showed changes, i. e. one-half of the cases. In both combined cases in which the meningitis was the prominent diseases, the fundus was normal (7.65). Of the uncombined cases, whose fundi remained normal, case 12 was under observation 3 weeks; the eyes were repeatedly examined, especially on the day of admission and one day before death; always normal. Case 36 was treated almost 2 months; the eyes were examined after $1\frac{1}{2}$ months and were normal; 14 days later death occurred with typical

meningeal symptoms. In case 43 the disease was fatal in 5 days; 2 examination of the eyes made when the meningitis was at its height gave no changes on the fundus. Case 7 was under observation 4 days; a double examination made when the meningitis was most pronounced found nothing abnormal in the eyes. Even case 65, where the autopsy showed an encephalitis and pachymeningitis interna in addition to the meningitis, resulted fatally in 3 days, with normal fundi.

Of the 4 cases, showing changes on the fundus, 2 showed simply a bilateral hyperemia (37, 62); twice there were severe changes in the form of bilateral neuritis optica (52) and choked disc (64). The fortunate results of case 62 could perhaps speak against regarding it as a purulent meningitis. I will remark, however, that the disease ran its course with the plainest symptoms of purulent meningitis; a simple serous meningitis can be excluded with certainty by means of a dozen lumbar punctures that always gave a diffusely clouded fluid with numerous leucocytes and encapsulated diplococci. In case 52, we see a unilateral neuritis optica already developed in 7 days, which lasted $1\frac{1}{2}$ months till death. The autopsy showed a purulent exudate in the ventricle. In case 64, a hydrocephalus accompanied the bilateral choked disc.

3. Sinus Thrombosis.

Thrombosis of the sinus was found 35 times in 76 cases; 12 times it was without any accompanying intracranial complication; 23 times combined with some other disease; in 3 of these cases, its symptoms were overshadowed by the other disease (17, 31, 53). Among these 35 cases, the fundus showed changes only 9 times, twice in the 12 simple cases and 7 times in 23 combined. The rarity of the fundal changes as a symptom of sinus thrombosis is striking. Pitt found exactly the opposite. He considers "the optic neuritis more suggestive of sinus thrombosis than of the other lesions", (*Brit. med. Journ.*, 1890, vol. I, p. 643). Hansen found, in 8 simple cases, changes 3 times; Koerner 1 time in 5 cases. Jansen found neuritis optica or choked disc very seldom in simple sinus thrombosis (*Archiv. f. Ohrenheilk.* Vol. XXXVI, p. 9.)

Let us examine the 2 simple cases with changes on the fundus (47, 49). We find both times profound changes; in

case 47 a bilateral neuritis optica, in case 49 bilateral choked disc. Case 47 was under observation from Jan. 13 to Feb. 21, i. e., over 1 month. On the second day after admission, there was found on both sides a hyperemia of the discs, and in places loss of distinctness; it was 18 days later that the neuritis optica began to develop, and 4 days later it was very distinct; about this time the pus was removed from the sinus, but this had no effect on the fundal changes; the neuritis optica continued to develop until death. A point of interest in this case was the finding of a large amount of a clear fluid in the meshes of the pia, at autopsy. This could also be demonstrated during life by lumbar puncture, and puncture of the dura of the field of operation. In this case, the existence of the neuritis optica is perhaps due to the increased pressure.

Case 49, which showed the most pronounced changes on both fundi, is noteworthy for 2 reasons: First, because for 5 days the choked disc was the only symptom of the intracranial disease. For 5 days there were absolutely no clinical signs of cerebral affection except the local symptoms caused by the ear disease. Not before the fifth day, although the choked disc became more and more pronounced, did other symptoms of brain involvement such as nausea, slowing of pulse, etc., appear. The operation was immediately performed and 3 days later the patient felt well, and there was a normal pulse; the choked disc was unchanged on either side. Even 3 months later the disc was still prominent. The second fact of importance is the favorable course in spite of the high degree of fundal changes. We will later touch upon the question of the role of optic lesions in the prognosis.

In the 4 cases of combined sinus thrombosis with fundal changes, (5, 18, 20, 55), there was once a simple hyperemia (case 18), 3 times neuritis optica or choked disc. In case 5, a choked disc developed in 12 days, more severe on the side of the diseased ear; the first ophthalmoscopic examination, made after the intracranial disease had existed for about 1 week with well marked and severe symptoms, showed only very slight changes on one side.

Case 55, showed an increase in the opticus changes after the operation and removal of the purulent focus; 17 days after the operation, the simple hyperemia of the disc had developed into a neuritis optica. In case 20, where a bilateral neuritis optica appeared 10 days before death,

there was found at the autopsy an extension of the sinus thrombosis into the sinus cavernosus of the same side. The involvement of the sinus cavernosus was manifested during life by edema of the lids and paralysis of the abducens. Let us compare case 39 with case 20. Here also the autopsy showed an extension of the thrombus from the sinus sigmoides into the sinus cavernosus, and here also this was expressed by edema of the lids and slight exophthalmus: on the other hand, an examination made 3 days before death showed a normal fundus. The examination was made 1 day before the operation and 2 days before the appearance of the edema: unfortunately the findings of the last 2 days are wanting, however, the disease was fatal in 3 days so that the time for the development of fundal changes was too short.

Jansen furthermore says, that his 3 cases of thrombosis of the sinus cavernosus, even coupled with suppuration of the vena ophth. sup. and the orbital cellular tissue, were free from well marked fundal changes.

4. Brain Abscess.

Our table contains 14 cerebral and 12 cerebellar abscesses. In the cerebral abscesses, the fundus was affected in 7 cases, i. e. in one-half, of which the 8 simple cases include 4 and the 6 combined cases include 3 with changes. Among the 12 cerebellar abscesses were 9 cases with fundal changes and only 3 with normal fundi: these changes were found 4 times in 5 simple cases and 5 times in 7 combined cases.

Opticus changes were found therefore in one-half of the cerebral abscesses and in the vast majority of the cerebellar abscesses: in the simple and in the combined in about the same ratio. PITT found neuritis optica very seldom in brain abscesses, "neuritis is not common with abscess". HANSEN found changes in 6 of 12 cerebral abscesses, i. e. in one-half of the cases, but on the other hand found changes only twice in 7 cases of cerebellar abscesses.

As to the kind of fundal changes, in the simple cases of cerebral abscesses there was twice a slight affection of the vessels (15, 21), and twice a well defined choked disc (41, 60). In the first two cases, which showed the slight changes, the abscesses were of unusual extent. In case 15, almost the entire left hemisphere was changed into an abscess: only a cranial mantle of about 3 centimeters thickness

remaining. The examination made 1 day before the operation gave only a tortuosity of the veins on the side of the disease; 3 days after opening of the abscess both sides were normal. In case 21, the abscess likewise extended from the temporal to the occipital lobe; in the beginning only a marked filling of the veins was observed, to which after the operation an indistinctness of the borders of the disc was added. A characteristic example of the increase in the fundal changes after a successful operation is shown in case 41.

The patient was examined at a time when the cranial pressure symptoms were very pronounced; the fundi were entirely normal. Four days after an abscess in the left temporal lobe was opened, the disc of the diseased side showed slightly indistinct borders; not until 1 month after the operation was a well marked choked disc found on the affected side; 11 days later, severe changes were found on the other side; about 3 months after the first examination, the borders of the disc on the side of the abscess were still not sharp, while the other side had returned to the normal. In case 66, the choked disc was not observed to recede until 3 months after the abscess was emptied.

In the 3 cases of combined cerebral abscess, there were the following changes; in case 28, bilateral neuritis optica, in case 42 bilateral choked disc, in case 31, bilateral marked hyperemia of the disc and retina, indistinctness of the borders of the disc. The severe changes therefore predominate in the cerebral abscesses.

The cerebellar abscesses show the following in regard to the character of the lesions.

Among the simple cases, there were found twice vessel changes, partial indistinctness of the borders of the disc (19, 70) twice bilateral neuritis optica (case 67) or choked disc (case 2).

Among the combined cerebellar abscesses, there were found 3 times neuritis optica, twice on both sides (3, 28), once on the side affected (17), in 2 cases vessel changes and indistinctness of the borders of the discs (16, 61), in case 16, rather well developed. As in the cerebral abscesses, so here there is a preponderance of the severe fundal changes.

The following can be said, as a result of our finding, as to the value of ocular changes in diagnosing diseases of the ear: any intracranial disease of whatever kind or extent can accompany the ear disease without causing the develop-

ment of fundal changes; normal fundi indeed are found oftener. On the other hand, on account of the great rarity of fundal changes in middle ear or mastoid suppuration, their presence is an important symptom in diagnosing an extension of the disease from the middle ear or mastoid to the organs of the skull. This diagnosis is made with certainty when the changes are of a high degree, either in the form of a neuritis optica or choked disc. No conclusion can be drawn from the ophthalmoscopic findings as to the kind of intracranial disease, although certain probabilities can be drawn from the scale of the frequency of the fundal changes in the different kinds of intracranial diseases. On the basis of the fundal changes, the intracranial diseases to be expected rank as follows: 1. Cerebellar abscess. 2. Cerebral abscess and leptomeningitis purulenta. 3. Extradural abscess. 4. Sinus thrombosis.

There is no rule as to the time of the appearance of the fundal changes. We frequently find the most pronounced changes as early symptom of the intracranial affection, sometimes when, as in case 49, the clinical symptoms are still absent; on the other hand, the clinical symptoms of the complication are often already perfectly distinct while the fundus is normal. The operation removes the purulent focus from the body; and now for the first time a change is observed on the fundus, which sometimes developed still further. Types of such cases are No. 55, in which the neuritis optica developed 17 days after the operation, and No. 41.

The changes usually appear simultaneously in both eyes, occasionally they exist for some time on the affected side and attain a marked development before they appear on the other side. An example of this is case 41, where a severe lesion of the fundus of one eye existed 27 days before the other eye showed any changes at all.

In many cases, the opticus affection is unilateral throughout the entire disease; e. g. in the 3rd case of group 2 (cases without pathologico-anatomic findings), where during 3 weeks, 5 examinations always gave a unilateral neuritis optica, the other eye being normal.

In this case, however, the ear disease was on the side of the healthy eye. Unilateral development of fundal changes occurred, also, in cases 15, 16 and 17, always on the side of the intracranial affection. Accordingly the finding of fundal changes on one side would allow the almost certain

deduction that the affection was on the same side of the brain. That, however, does not follow for the side presenting the greatest change, when both eyes show changes.

We come now to the question of the value of fundal changes in the prognosis of the intracranial disease. A comparison of the cured and fatal cases allows a conclusion to be drawn.

	Fundus	
Cases with fatal termination	Normal	Altered
47	29	18
Cases with favorable termination	Normal	Altered
29	17	12

We see that fundal changes are seen slightly more often in the cases with a favorable course than in those ending fatally. The appearance of an opticus lesion in the course of an intracranial disease does not necessarily mean a change for the worse. The prognostic value of fundal changes lies perhaps in their severity. The following is a comparative collection of our favorable and unfavorable cases on the basis of the kind of opticus affection.

Cases with Fatal Termination: 18 changes—7 vessel changes, 11 neuritis optica or choked disc.

Cases with Favorable Termination: 12 changes—5 vessel changes, 7 neuritis optica or choked disc.

We see that the more severe changes do not appear more often in the fatal than in those that get well. A difference is introduced, in regard to the frequency of the presence of severe fundal changes in the cured cases, when the cases of the second group (ear diseases with cerebral symptoms without pathologico-anatomic findings) are added. The conclusions to be drawn are that the changes on the fundi give no judgment as to the course and result of the intracranial diseases. The appearance of even the most severe changes on the fundus does not exclude a favorable termination of the disease.

I desire, in conclusion, to express my thanks to Geheimrath Prof. Dr. Passow for his kindness in allowing me to use the material.

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ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Speech-Hearing.

F. H. QUIX (*Netherlands Laryng., Rhin. and Otol. Society*) refers to the fact, that the results of determining the hearing acuity with the whispering voice are very changeable and not comparable with single tones. This can be eliminated by using the whisper in the following way: The sounds are divided in three rubrics: low, high, and mixed sounds. The whispered sounds also can be divided into groups, so that the strength of sound is equal for sounds of the same group. The comparison of the hearing acuity for words of a certain group can easily be made with special tuning forks, (preliminary communication). Prof. Zwaardemaker stated that Dr. Reuter (Ems) repeated these experiments this winter with the German language. The hearing acuity of his people was 1.3 times larger than the average of the people of Quix; the three distance zones bear a proportion as 1-2-4, so that every hearing acuity must be represented with 3 values. Our usual clinical hearing acuity is the average of these 3 numbers.

Quix stated, in reply to Dr. Moll, that for practical purposes it is sufficient to use words of the intermediate zone.

Blaauw.

Malignant Angioma. *Starting from the Auricle.

STRUYCKEN (*Netherlands Laryng., Rhin. and Otol. Society*) saw a child, some weeks old, where an angioma formed in a few months, starting from the external ear canal, which spread from the jugulum for four fingers' width over the almost completely destroyed auricle and from the proc. zygomaticus toward the occiput. Neither cauterisation, nor electrolysis, etc., could stop the growth. Extirpation was too dangerous, therefore tying of the large vessels of the neck was decided upon: Vena jugularis in- and externa, which had a diameter of 1.5 cm. and also the common carotid were tied twice, but not cut through.

Patient stood this very well; the tension of the tumor diminished considerably; on the operated side the skull showed during the first weeks a distinct flattening, which, however, slowly disappeared.

Blaauw.

Pathological Anatomy of the Labyrinth.

Dr. F. H. QUIX (*Netherlands Laryng., Rhin. and Otol. Society*) used a combination of celloidin with cedar oil and paraffin, which fills all holes well, and the specimen can be treated as paraffin section. The whole labyrinth gives hundreds of sections 10 to 15 μ . For the sake of cheapness he uses the varnish of Cox, as used in psychiatry, and for object glasses photographic plates which had been used. He shows serial sections of different animals so treated, as cavia, mouse, pig, horse, etc. In the collection of Prof. Zwaardemaker he had found an old specimen with the diagnosis "labyrinth-deafness with phthisis pulmonum" (1893) without further comment. It shows atrophy of the organ of Corti; all nerve elements have disappeared and are replaced by epithelial cells, which form in some places a small plug upon the membrana basilaris. The membrana tectoria is greatly diminished in size in all its windings and sticks to the epithelial plug. The rest of the organ of Corti is a small streak on the surface of this plug in the superior windings. This is interesting as the true nature of the function of this body can perhaps be learned, because we might deduce that when the organ of Corti atrophies, which here is very clear, the membrana tectoria also atrophies and can adhere to the remnant of the organ. The nerve fibres and ganglia cells seem to be without change; the entire middle ear, cut in connection with the cochlea, is entirely normal.

Dr. Quix then showed dancing-mice, which he found to give reaction to no tone, while white mice react to all tones between B^2-C^3 , while their sensitive zone stretches over the fifth and sixth striped octave. We may deduce with a great amount of probability, that the gamut of the sensitive zone for mice, in comparison to men, is transferred upward nearly an octave.

Blaauw.

A Case of Otogenic Sinus Thrombosis with Large Extradural Abscess.

ZAALBERG (*Netherlands Laryng., Rhin. and Otol. Society*) showed the girl, who suffered from an otitis media sinistra two

years ago, which then apparently healed. In June, 1903, pain over the left mastoid appeared, with little secretion from the ear. On July 5 rigors appeared with rise of temperature to 40° ; a couple of days later the temperature was intermittent, between 40.1° and 35.5° . The general condition grew worse, the swelling behind the ear increased; now and then vomiting spells. Pulse and respiration in accordance with the temperature. On July 30 Zaalberg saw the patient for the first time. He made the diagnosis of mastoiditis with probable sinus thrombosis, and operated. The pus, of a bad odor, streamed out; a fistula in the planum mastoideum was enlarged with Doyen's drill; the wall of the sinus was discolored; no blood was found with the syringe, the wall was cut open with a pair of scissors. The cranial cavity was also opened and a mass of pus escaped. Convulsions put an end to the operation. On the next day the temperature did not rise above 38° , but much pus came from the side of the bulbous jugularis, also after pressure on this region. Therefore the bulbous jugularis was laid open on August 2, after which the suppuration ceased. Thereafter uninterrupted recovery. Zaalberg treated also a 60-year-old woman with thrombosis of the sinus, who came stuporous into the hospital; she again regained consciousness after a few collargol injections, and recovered. Although collargol injections may be of no value, and it cannot be said with certainty in this case that the favorable turn was due to the collargol action, it is remarkable that patient recovered, considering the seriousness of the disease and the very unfavorable prognosis. As he had not seen any unfavorable consequence he recommends it warmly. *Blaauw.*

A case of Extra-dural Abscess.

I. C. HENKES (*Netherlands Laryng., Rhin. and Otol. Society*) saw for the first time, end February, 1903, a 38-year-old woman, who complained of pain behind the right ear, radiating toward the occiput, running ear and deafness on the same side. Three months previous she had influenza with much headache and especially pain behind the ear. After recovery earache came on, which being treated with eardrops and poultices, resulted in a discharge a few weeks later. The occipital pain was severe especially in the night. She looked bad; pulse 88, regular. A little, non-fetid pus in the right external ear. After removal, a small perforation behind the umbilicus became visible, the drum was somewhat injected. Only the posterior

part of the *proc. mastoideus* was a little sensitive. Behind the mastoid a little swelling was found and some pain on pressure but no discoloration of the skin was seen. The watch was heard only on pressure against the ear, whisper in the direct proximity; secretion moderate. The perforation was enlarged with the knife; ice behind the ear. No change in the condition within 14 days. She was operated on March 17; on the evening before, the temp. was 36.9° , pulse 88. After shaving, a place behind the mastoid, size of a dollar, was found edematous, no discoloration of the skin. Retroauricular incision down to the bone, which was not changed. No pus nor granulations in the antrum or the adjoining cells. An incision 4 cm. in extent, backward, perpendicular to the first one, was made. The bone here was soft, cells with pus and granulations were found in the depth, also a fistula, going forward and inward, becoming finer and then lost. On removal of the posterior pus-containing cells, a teaspoonful of thick yellow pus appears from between dura and bone. Sinus and dura, both covered with bluish-red granulations, were laid bare. The sinus lay very far backward, did not pulsate, was elastic. Henkes, after removal of the granulations and diseased bone, tamponed loosely with iodoform gauze. Highest temperature after the operation: 37.5° . The headache immediately disappeared; after a week she was treated in polyclinic and the otitis media was already healed. The wound healed in a month. A slight noise in the ear was cured by Politzerizing; whisper at 5 meters. Although it can never be determined with absolute certainty, Henkes believes this extradural abscess to be the sequence of a primary otitis of the mastoid after influenza, while the otitis media was secondary. In this case the symptom of Griesinger (edematous swelling and sensitiveness on pressure without discoloration of the skin behind the intact *pars mastoidea* on the border of the *os occipitale* and at the posterior part of the mastoid itself) was not the consequence of passive edema but of inflammatory edema.

Blaauw.

A Case of Cured Otitic Sinus Thrombosis.

P. TH. L. KAN (*Netherlands Laryng., Rhin. and Otol. Society*) showed a 20-year-old workman in a factory, who had been taken to the surgical ward of the Leiden Hospital with a bilateral otorrhea: Prof. Korteweg made the diagnosis of otitic sinus thrombosis with thrombosis of the *vena jugularis*; he opened the latter and drained it. Kan performed radical

operation the next day, when he found a purulent thrombosis of the sinus transversus. The thrombus was removed as much as possible and iodoform glycerin was injected upward from the wound of the jugularis. The reaction of the wound was normal on the left side, but the fever remained and 13 days after the operation an extensive edema of the occiput and face appeared on the right side. A hard cord was felt under the right musc. sternocleidomast. Prof. Korteweg opened the right vena jugularis which contained fluid blood under more than normal pressure. Kan then performed the radical operation on the right side; the bone of the mastoid was filled with blood under high pressure, a purulent cholesteatoma in the middle ear cavity, the sinus contained fluid blood under very high pressure. The bad condition of the patient did not allow the performance of a plastic. High temperature still remained for many days, an extensive decubitus and a perichondritis of the left auricle being the cause, but finally he was cured. The wound behind the auricle closed per granulationem. Kan could not explain satisfactorily this high pressure; of the possibility of a thrombosis of the bulbous venae jugularis he was not so very certain.

Blaauw.

Otitic Pyemia.

FREYTAG, MAGDEBURG, (*Archives of Otology*, Vol. xxxiii., No. 6.) CASE 1. Acute otitis media after measles. Empyema of the mastoid process on both sides. Osteophlebitic pyemia. Metastasis in the sterno-clavicular articulation.

As the pain complained of was in the right ear, the right mastoid was opened and cleared of pus and granulations. As the general symptoms persisted 4 days later the left mastoid was operated on and showed the same condition as on the right side.

The child's general improvement was now very striking. In a few days the sterno-clavicular involvement had disappeared.

CASE 2. A man, aged 36 was operated upon for chronic otitis media with polypi and caries in the attic and antrum. During the operation the sinus was exposed. Five days later there was high fever, severe headache, anorexia. On changing the dressing there was found at the region of the exposed sinus wall a small pulsating drop of pus. Elevated temperature persisted for a few days and then gradually receded. Three weeks later he complained of pains in the occiput corresponding to the course of the sinus. The sinus was exposed back-

wards as was also the dura covering the cerebellum but were found perfectly normal. There were no further disturbances.

CASE 3. A boy, aged 4, had a fetid otorrhea following scarlet fever, which according to experience in the ear clinic in Halle is important prognostically as evidencing a severe course of an aural suppuration. Even before the otorrhea, the left mastoid had become swollen and fluctuated. The left mastoid was opened and 6 days later the right was operated upon. The cells and antrum on both sides contained pus and granulations. As conditions did not improve and as there was evidence of bone necrosis in the left wound, 7 days after the primary operation the necrotic bone was removed and the sinus exposed. On opening the cranial cavity thick fetid pus was encountered and was followed by hemorrhage from the ruptured sinus. Packing speedily stopped this bleeding, the sinus and surrounding dura were covered by unhealthy granulation and pus, so the sinus wall was incised and soft thrombic masses removed until a free flow of blood came from the peripheral end.

As pressure on the neck some days later forced pus and thrombi out of the sinus the jugular was ligated. Still there had been sufficient absorption for fever and chills to persist for some days.

Campbell.

Two Cases of Abscess of the Temporal Lobe of the Brain.

Voss, RICH. (*Archives of Otolaryngology*, Vol., xxxiii., No. 6), Case 1. Three and a half weeks after a fall on the head with unconsciousness and hemorrhage from the left ear, that ear began to discharge copiously. Increase of pain suggested the presence of fracture of the base of the skull and it seemed that thus the ear had become infected. Operation revealed an extradural focus of granulation tissue and thus excluded the presence of a basal fracture. The temporary improvement was followed by high temperature and violent delirium. Autopsy later showed that in the exploration of the temporal lobe the scalpel had passed within 2 cm. of an abscess the size of a cherry in the lower part of the lobe. The surrounding parts of the brain were infiltrated and the abscess had perforated into the ventricle.

CASE 2. A boy with discharge from the right ear for 4 years was suddenly taken ill with violent headache, vomiting and fever. In a few days he felt so well that he returned to school. The headache however immediately recurred, localized in

the frontal region. No pain in the region of the ear. Temperature was normal, pulse 58 and irregular, eyelids edematous. On operation granulations were found in the antrum, the anvil was removed but no hammer could be found. The sinus appeared healthy. The long opening was enlarged so as to expose the dura of the cerebellum and of the temporal lobe. The temporal lobe was punctured with a syringe and an intensely fetid frothy, greenish-brown fluid withdrawn. After incision half a glass of the same fluid intermingled with gas escaped. From this time on there was steady progress towards recovery.

Campbell.

Three Cases of Tumor of the Ear.

GERBER, KÖNIGSBERG (*Archives of Otolaryngology*, Vol. xxxiii., No. 6). *I. Fibroma*.—This tumor is interesting, not only on account of its localization but also on account of its size, it being as large as a plum and rising with a rather broad base directly below the helix and covering the anti-helix, the spine of the helix, the concha and the entrance of the auditory canal.

There were no glandular swellings and it was enucleated under cocain anesthesia.

II. Tuberculoma.—An otherwise healthy girl, aged 20, had an enlargement of the left lobule since infancy which had gradually increased in size till it was the size of a small walnut. The consistency is that of a normal lobule. There was no glandular enlargement and the condition was considered as one of macrotia. Histologic examination showed a typical cutaneous tuberculosis with several giant-cell tubercles.

Inoculation had probably taken place at the time of puncture of the lobule for an ear-ring.

III. Carcinoma.—A man, aged 40, with right-sided otorrhea since childhood. One year ago the right auditory canal swelled up and severe pain was experienced. An operation brought about improvement. One month ago a growth formed behind this ear, which has rapidly increased to the size of a fist. Hearing on the right side for ordinary voice is zero. Weber lateralized to the right. The external canal is filled with lobular, brownish granulation tissue. The auricle up to the thickened lobule is normal. There are a number of small hard cervical glands to be felt on the right side. A section removed from the auditory canal proved to be typical epithelioma. On operation a triangular defect in the bone was found, with its base towards the posterior auditory canal and the

apex directed towards the posterior cranial fossa, measuring 2 cm. horizontally and 3 cm. vertically. The antrum and surrounding cells are filled with granulations and pus, so likewise are the attic and tympanum. There are no ossicles. The posterior wall of the tympanum, the prominence of the horizontal semi-circular canal, and the facial nerve show normal conditions. After removal of the granulations the dura of the middle cranial fossa was exposed. A copious hemorrhage from the sinus precluded further operation.

Four months later the patient died of debility. All operation could hope for was a retarding influence upon the growth of the tumor.

Campbell.

On the Statistics of Otitic Diseases of the Brain, Meninges and Cerebral Sinuses.

TAKABATAKE, NAGASAKI, Japan, (*Archives of Otology*, Vol. XXXIV., No. 1) publishes the results found in 54 consecutive cases in the ear clinic of University of Rostock. Thirty-four were uncomplicated if one disregards the slight changes in the external surface of the sigmoid sinus in perisinous abscess. Of the uncomplicated cases the extradural abscesses are the most frequent and of these, perisinous ones occurred 15 times while those in the middle fossa 7 times.

Of the complicated cases, the absence of meningitis serosa and the relative infrequency of brain abscess (two in the temporal lobe and two in the cerebellum) are striking features.

The old idea that chronic suppurations only led to intracranial complications is so far disproved, that in the 54 cases, known duration in 1.

Campbell.

Double Mastoiditis Followed by Diphtheritic Exudation (on the wounded surfaces) with Fatal Result.

HORLBECK, Columbia, S. C., (*Archives of Otology*, Vol. XXXIV., No. 1). A child, aged 4½ years, sick with measles developed purulent otitis media in both ears which was speedily followed by mastoid complications. On operation the cellular substance was broken down and filled with pus and granulations. On the left side was a small Bezold perforation of the inner plate.

Three days later both wounds were covered by a dense, dirty greenish pseudo-membrane which on cultural examina-

tion showed the presence of Klebs-Loeffler bacilli. The throat was congested but had no membranous deposit.

Three thousand units of antitoxin was administered but the patient failed to rally. No throat culture was taken but the case was probably a typical one of wound-diphtheria.

Campbell.

The Radical Operation in Chronic Middle-Ear Suppuration.

DENCH, New York (*Archives of Otolaryngology*, Vol. xxxiv., No. 1). During a period of 8 years, 14,487 cases of chronic and 4,836 of acute suppurative otitis media were under observation. Of these 218 suffered from severe intracranial complications. These records fail to show, but it is a well known fact, that intracranial involvement more frequently follows chronic suppuration.

While the simpler procedure of removal of the ossicles and curettment of tympanic cavity, is all that is required to relieve cases of middle ear suppuration in which the destruction of bone is limited to the ossicular chain, and to those parts of the tympanum easily reached through the meatus, the larger proportion of cases of middle ear suppurations demand the radical operation.

The complete radical operation requires:

1. The complete removal of the upper wall of the canal, so as to thoroughly expose the tympanic vault.
2. The removal of the posterior wall of the canal avoiding the facial nerve, carrying out this step so completely as to entirely obliterate the posterior tympanic space, that is that portion of the tympanic cavity which is hidden from view by the posterior wall of the external auditory meatus.
3. The obliteration of the hypotympanic space, by removal of the inner extremity of the inferior wall of the canal, in order to expose freely that part of the middle ear which lies below the level of the lower wall of the bony meatus.
4. A thorough curettage of the tympanic orifice of the Eustachian tube, to cause a complete closure of this channel, and to prevent reinfection of the tympanic cavity from this direction.

Of the cases operated upon in a large proportion the hearing was excellent—that is the whispered voice could be heard at a distance of 6 feet or over.

In none of the 98 cases operated upon was there permanent facial paralysis. In about 9% of cases there was some slight

interference with its function coming on from 2 to 6 days after the operation. In one case there was serious interference with the facial muscles for over one year but ultimately complete restoration of function took place. *Campbell.*

A Case of Chronic Purulent Otitis with Cholesteatoma and Numerous Endocranial Complications. Operation. Recovery.
With Remarks upon the Diagnostic Value
of Lumbar Puncture.

ARNOLD KNAPP, New York, (*Archives of Otology*, Vol. xxxiii., No. 6.) A congenitally syphilitic girl, aged 16, had suffered from double purulent otitis since an attack of scarlet fever at the age of 6. During the past year she had had pain in the left ear and vertigo. There suddenly developed chills, nausea and severe headache. The left canal was narrowed and filled with fetid pus, marked tenderness and swelling over the left mastoid.

Operation evacuated a subperiosteal abscess and a fistula was found leading into a large cavity, which occupied the entire mastoid process. The sinus and adjacent dura were bare and covered with granulations. The tympanum and inner portion of the external auditory canal were filled with cholesteatomata and granulations. There was a large defect in the external semicircular canal, which contained granulations. The tegmen antri was carious and on its removal pus escaped. The dura at that point was covered with apparently healthy granulations.

The wound was packed and kept open. Two weeks later a Panse meatoplasty was performed. As granulations had formed in the depth of the wound, these were subsequently curetted, the patient became very sick with high fever, delirium, rigidity of the neck and vomiting—all suggestive of meningitis. Lumbar puncture elicited a very turbid fluid but free of bacteria. From this time on patient gradually improved and was in apparently much better health than she had enjoyed in years. *Campbell.*

Two Cases of Temporo-Sphenoidal Abscess. Operation. Recovery.

LEWIS, New York (*Archives of Otology*, Vol. xxxiv., No. 1) Case I. That of a long standing purulent otitis media sinistra. After "grippe-like" symptoms for 5 days a severe chill was followed by an elevation of temperature up to 104° F. with violent left sided headache extending to the neck. Pyemic

symptoms developed, slight left facial paralysis and amnesic aphasia. Drowsiness with slow cerebration, tenderness over the antrum, tip and emissary vein.

On operation the incision was carried forward so as to expose the entire squamous plate of the temporal bone.

The antrum was filled with fetid cholesteatomatous material. The sinus was covered with pus and granulations. A probe could be passed through the tegmen tympani into the cranial cavity for some distance, on its removal a dram of fetid pus flowed out. The radical mastoid operation was completed, the whole of the squamosa and part of the anterior inferior angle of the parietal bone were removed. The exposed dura was blackish in spots and everywhere covered with lymph and bathed in pus. This extradural abscess covered the temporo-sphenoidal lobe. A scalpel was passed directly into the brain at this point and carried upward and forward for three quarters of an inch where it entered an abscess cavity about the size of a very large walnut. No irrigation; sterile gauze packing was employed. The facial paralysis quickly cleared up, aphasia gradually disappeared and the patient was discharged from the hospital at the end of two months.

Case II. was likewise one of long-continued otorrhea. Right ear pain, mastoid tenderness and excruciating headache localized above and in front of the auricle demanded a radical mastoid operation. The middle fossa was opened and the dura over the anterior portion of the temporo-sphenoidal found very tense and injected. The dura was incised and three ounces of fetid pus flowed out. For three weeks the progress towards recovery was so rapid that she was allowed to go home. Then she was found semi-comatose with a temperature of 106° F. The dura mater wound was reopened and from it pus spurted a distance of two feet. The abscess cavity was very large and extended well up into the frontal lobe. The supposition is that there were originally two abscesses and at the first operation the superficial one only was drained. *Campbell.*

**Report of a Case of Temporo-Sphenoidal Abscess, with
Streptococcus Infection. Operation and Recovery.**

STEPHENS, New York (*Archives of Otolaryngology*, Vol. xxxiv., No. 1). The patient, aged 21, was admitted to the hospital suffering from an acute suppurative otitis media. The mt. was red and bulging especially in the anterior superior quadrant. General tenderness over the mastoid area. On para-

centesis the few drops of creamy pus showed abundance of streptococci in long chains. As he complained of persistent frontal headache and as the mastoid tenderness increased, three days after admission the mastoid was opened, and the entire cell structure removed. His general condition failed to improve. There was almost continuous frontal headache, the heavy coating of the tongue and fetor of the breath continued with anorexia and constipation. On several occasions pulse dropped to 60 per minute. On the 19th day after the mastoid operation he was somnolent; on being roused took nourishment and answered questions properly but cerebration was slow. He had a double choked disc. Next day he had projectile vomiting and optic neuritis had increased. The primary mastoid operation was converted into a radical one. The ossicles and granulations were curretted from the tympanum. The tegmen antri, the tegmen tympani and a portion of the squamosa were removed exposing an area of dura about the size of a half dollar. Granulations on the dura over the tegmen tympani were now observed. A bistoury was introduced through the area, upwards for three quarters of an inch. About three ounces of creamy, odorless pus was evacuated which contained streptococci only, in great abundance. A light wick of iodoform gauze was introduced into the abscess cavity for drainage. At subsequent dressings Whiting's encephaloscope enabled one to examine the cavity readily, to wipe away pus clinging to its walls and to re-introduce a gauze wick. The convalescent period was uneventful. *Campbell.*

Some Points Respecting the Surgical Anatomy of the Facial Nerve.

ALDERTON, Brooklyn (*Archives of Otolaryngology*, Vol. xxxiii., No. 6) after preparing a number of temporal bones, injected the facial canals through the styloid-mastoid foramina with a boiling solution of carmine in beeswax. In each, two horizontal sections were made, one on a level with the spina supra-meatum, the other with the floor of the orifice of the external auditory canal.

In 18 bones, 9 dehiscences were found, in that part of the facial canal, bordering on the cavity of the middle ear; all of these were near the fenestra ovalis.

The author and Noltenius, in an examination of 40 bones, found an average distance of 15.7 mm. from the spina supra-meatum to the facial canal. The minimum distance was 11 mm.

The facial canal in its vertical portion is on an average 3.5 mm. from the nearest point of the posterior edge of the annulus tympanicus.

In none of the specimens did the injection escape from the aqueductus Fallopii into the internal auditory canal. Yet it did escape from the hiatus Fallopii into the middle cerebral fossa in seven of the specimens. This fact certainly indicates that the track of injection from the middle ear along the facial canal proceeds more readily towards the middle cranial fossa than towards the internal auditory canal and posterior cranial fossa
Campbell.

Three Cases of Lateral Sinus Thrombosis.

LEWIS, New York (*Archives of Otolaryngology*, Vol., xxiv., No. 1).
Case I. A boy with fetid discharge from the right ear of three years' standing suddenly developed chilly sensations, severe headache and vomiting.

The mastoid was opened and the sinus down to the bulb exposed. Upon opening the sinus it was found to contain a greenish mass; the inner wall was necrotic and discolored and the adjacent cerebellum bulged. Upon puncture a free flow of serum was obtained. Cholesteatomata were removed from antrum and tympanum. On removal of the sinus clot, blood flowed freely from above but not from below. After packing the mastoid wound, the jugular vein was resected. Recovery was uneventful.

Case II. A man, aged 21, was seized with pain in the right ear, followed by rupture of the mt. and discharge. Seven days later because of insufficient drainage and mastoid tenderness a paracentesis was done, ice-coil and irrigation employed. During the next two weeks paracentesis was done a second and a third time; then the mastoid was explored and a cortical perforation leading down to an exposed sinus found. The sinus was bared from knee downward to the jugular bulb, it was covered with granulations and necrotic. The emissary vein was wounded. For 2 months there was apparently favorable progress, then the temperature ran up to 105.8° F. The mt. was congested and bulging and as a mastoid sinus persisted an exploratory operation was done. A little necrosed bone was found in the aditus ad antrum; the sinus was exposed and incised, free bleeding occurred from above but not from below until pressure was made on the neck. Forty-eight hours

later as the temperature remained high the internal jugular was resected and its wall found infected by streptococcus.

Facial erysipelas and septic pneumonia later developed. Then an abscess developed and was opened in the guleal region. Against advice and with a daily rise of temperature to 99.4° F. he left the hospital and shortly afterwards died.

Case III. Was admitted in a semi-comatose condition. Temperature 104.5° F. The tissues over the mastoid were edematous and acutely sensitive to pressure. The upper and posterior auditory canal was sagging. On operation the mastoid was found so disintegrated that the sinus was exposed and found covered with a purulent exudate. The radical operation was completed and the sinus exposed from one inch back of the knee downward to the bulb. On its being incised a free hemorrhage occurred from the torcular end but none from the jugular end. The mastoid wound was packed, then the internal jugular was resected. The septic thrombus extended into the subclavian vein to an indeterminable extent. As the patient was in extremis further operative procedure was out of the question. Both inner and outer walls of the sinus contained enormous numbers of mixed micro-organisms.

Campbell.

The Palliative Treatment of Acute Mastoiditis and Its Limitations.

PHILIP HAMMOND (*Journal American Medical Association*, November 26, 1904). The question of the most appropriate time for surgical intervention is one in which experience must play a large part. Undoubtedly many of the cases which eventually recover when left to themselves contain pus, but this by no means should establish a precedent for allowing cases to go on without operation. Where tenderness of the mastoid exists for days, even in slight degree, with abundant purulent discharge from the ear, or where after once subsiding, the tenderness returns, operation is undoubtedly expedient, even if not absolutely necessary.

Under no circumstances should attempts at prevention of operation be continued where edema has already appeared in the region of the mastoid, as with this condition the amount of damage inside the bone may be merely conjectured, and surgical interference becomes imperative.

The paper is based on the study of fifty consecutive cases taken from hospital record during a period extending over six months.

Free incision of the drum was made in all cases where there was not sufficiently good opening. Rest in bed for the first day or so, the continuous use of the Leiter coil, cleansing of the auditory canal and attention to the alimentary tract comprised the treatment following the paracentesis.

Thirty resulted in recovery with disappearance of mastoid symptoms; seventeen came to operation during the stay in the hospital, and three patients who were discharged apparently relieved, subsequently returned for operation.

Mastoid tenderness in some degree was present in all but three of the cases. Some were very tender throughout the whole mastoid, while some exhibited simply localized tenderness on very firm pressure over the antrum or tip of the process.

The average time the cold coil was worn was slightly over 48 hours.

Acute purulent infection of the bone was found in all cases on which operation was performed, accompanied by granulation formation, and generally by softening of the bone.

Richards.

Two Cases of Cured Cerebellar Abscess.

FERDINAND ALT, Vienna, (*Monatsschrift für Ohrenheilkunde*, July, 1904). One was caused by an acute, the other by a chronic purulent inflammation of the middle ear. Both abscess cavities were closely related to the diseased bone, and connected with it through a fistula in the dura.

The first mentioned abscess was reached by following its fistula. After the method of Jansen, which is the removal of a part of the median wall of the antrum, and the bony structure between it and the transverse sinus, thus, the opening was between the semi-circular canal and median edge of the transverse sinus. The other abscess was reached after the method of Macewen, by making an opening back of the transverse sinus.

Neither case showed well defined symptoms of cerebellar abscess. The abscesses were found by following the fistula. Healing was complete.

Foster.

Otitic Brain Abscess. Report of Two Cases. Observations Concerning the Disease.

GEORGE F. KEIPER, Lafayette, Ind. In the first case the op-

eration was done for mastoid abscess without suspecting brain abscess. The patient was a housewife, aged 26. The bone beneath the mastoid cortex was very necrotic. After clearing away all the debris it was found that the tegmen antri was necrotic, and on removal, pus began to flow from the brain cavity. This cavity he explored with his little finger. It involved the temporo-sphenoidal lobe right over the tegmen antri. The cavity was dry-cleansed thoroughly and a decalcified bone drainage tube inserted. Temperature was 99°, pulse 150.

The wound was not dressed until the third day, when the tube was removed from the brain cavity. Its removal was followed by a gush of pus from the brain, relieving the headache. The drainage tube was obstructed. It was cleansed and replaced. The patient thereafter, whenever there was any obstruction to the flow of pus, complained of headache, which was relieved by cleaning the drainage tube. To keep the brain cavity clear of pus, he was compelled soon after to abandon all tubes for drainage and to rely upon wicks of sterile gauze introduced to the depth of the abscess cavity. Even then the wound in the dura mater attempted to close before the walls of the abscess cavity had grown together, necessitating enlarging the opening in the dura by artery forceps introduced closed and opened in the cavity and pulled out open, to tear the wound in the dura mater larger.

The after history was uneventful and recovery complete.

The second case, a man, aged 30, who, when first seen had had fifty convulsions during the previous twenty-four hours, and had been unconscious for forty-eight hours. There was a history showing involvement of the left mastoid process with recurrent purulent discharge from that ear, for a number of years. A few days before he had come home in a dazed condition, answering questions and talking incoherently. Examination of the ears was negative. An abscess of the left temporo-sphenoidal lobe was thought probable.

The left mastoid process was opened, found sclerosed. The opening was continued upward, uncovering the dura mater, which, on being incised, let out considerable fluid and flocculi of necrotic brain tissue. Exploration revealed no further trouble apparently. The next morning there were convulsions, and death occurred forty-eight hours later. Post-mortem examination showed a diffuse leptomeningitis. In the temporo-sphenoidal lobe was a cavity capable of holding three

or four drams of such matter as was removed during the operation. Search for multiple abscesses failed to reveal any.
Richards.

A New Means of Securing Permanent Dilation of the Eustachian Tube.

D. D. ACHSHARUMOW, Poltawa, (*Therapeutische Monatsshefte*, translated by D. B. ST. JOHN ROOSA for the *Post-Graduate*, December, 1904.) "The air is blown into the tympanic cavity by means of a part of the ordinary apparatus used for spraying the nostrils or larynx. On the free end of the rubber tubing, a proper tip to fit the nostrils is inserted, and for convenience of use, the tube between the two air bags should be doubled in length by an intermediate piece. The patient who wishes to treat himself sits or stands before a table upon which the apparatus lies, having inserted the nose piece and closed the nostrils over it with two fingers of the left hand, *the mouth being open*, the procedure begins. Seizing the terminal air bag of the apparatus with the right hand, it is pressed together several times until the second air bag is sufficiently distended. This widens the opening to the Eustachian tube and the strong tension of air is felt in the inner ear. The opening of the tube and the membrane of the drum remains in this moderately dilated condition so long as the nose is hermetically closed, and the second air bag fulfills its function of not allowing the air to pass backward. The right hand is then pressed on the second air bag and pressure made with strokes that are light and quickly following each other, by which the opening of the tube is enlarged in spurts and the drum head put in vibration. This pressure must be made very rapidly at the rate of 150 times in a minute, perhaps more. When the nose is kept closed, the bag air tight, and the tension of the air moderate, these passive gymnastic exercises can be kept up on both structures as long as we like, but in general, in consequence of incomplete closure of the nostrils, the air bag becomes relaxed and must be filled again by a little pressure, consequently some minutes will be taken up. Each pressure of the hand, even the resting of the fingers on the second air bag causes the sensation of a light blow in the ear. This method constitutes a kind of vibratory massage of the affected portion, the walls of the opening of the Eustachian tube, the Eustachian tube itself and the membrana tympani."

Richards.

Suction as a Means of Treatment in Diseases of the Ear.

SOUDERMANN (*Archiv. für Ohrenheilkunde*, Vol. 64, Part I.) The author recommends its use in cases of both acute and chronic suppurative otitis and describes a new apparatus which he has invented for this purpose which is made in the form of a mask to fit over the external ear and so can be used without pain and by the patient at home. It should be used sufficiently often to keep all secretion out of the ear. An additional value therapeutically in the author's opinion is derived from the artificial hyperemia produced. A recent monograph by Bier on "Hyperemia as a therapeutic measure" is quoted in substantiation. The histories of a number of cases are given showing the benefit derived from the treatment. *Harris.*

Prophylaxis of Acute Otitis Media.

JUL. VEIS, Frankfurt, (*Monatsschrift für Ohrenheilkunde*, Feby., 1904). The majority of men blow their noses by closing or partly closing both nasal orifices and forcing air through the nose, which often forces air and secretion, about the Eustachian orifice, into the tube and middle ear. The more secretion in the nose and naso-pharynx, the more force is used to remove it, and consequently the danger of carrying infectious material into the middle ear.

Text-books generally recommend blowing one side of the nose at a time by closing the other. This works well when the force is not too great and the two sides are nearly equal.

Veis advises the freeing of the nose from secretion by moderately blowing the nose, with a handkerchief held beneath and both nasal orifices open. *Foster.*

II.—NOSE AND ACCESSORY CAVITIES.**Comparison of Nose and Mouth Respiration.**

PROF. ZWAARDEMAKER (*Netherlands Laryng., Rhin. and Otol. Society*) shows pictures on the screen relating to the movements of the respiratory apparatus and the currents which arise. The complete synchronism between the contraction of the diaphragm and the movements of the thoracic walls is demonstrated. Three air chambers connecting through narrow openings, are distinguished. The size of the naso-pharynx

geal chamber is estimated at 90 c. cm., of the laryngo-tracheo-bronchial chamber during life at 100 c. cm.; the alveolar chamber is estimated to have a mean capacity of 2400 c. cm. The width of communicating openings, measured in the cadaver, is (a) for both nose openings 2 c. cm.; (b) for the glottis 0.55 c. cm.; (c) for the bronchi proceeding from the trunk-bronchi, which ramify dichotomically, 5 c. cm. This means for the reduced area of the nasal cavity $2 \times 0.4 \text{ c. cm.} = 0.8 \text{ c. cm.}$ (Gevers Leuven); for the reduced area of the glottis 0.5 c. cm.; for the reduced area of the bronchi, originating from the trunk-bronchi, 4.4 c. cm. Some new experimental methods, used for some months in the Utrecht laboratory, showed the following results: (1) the maximal velocity of the expiratory current is smaller than that of the inspiratory current. The first is on an average 1.2 m. a sec., the last 1.6 m. a sec. (in the trachea). (2) Moist warm air enlarges the superior air canals and augments both respiratory velocities (Gevers Leuven). (3) The velocity curve of the respiratory current is not a sloping zigzag line, similar to a pneumogram, but a curved one, as the section of the plaiting of a mob cap. (4) It shows large individual variations, 5 types of which are demonstrated (Ouweland). (5) The medium respiratory volume, reduced to 0.0 c. and 760 m. m. Hg., is 503 c. cm. (6) It is larger with oro-nasal than with nasal respiration alone.

The advantage of nasal respiration will be found (a) theoretically in the philogenesis (the development from a condition with separate chamber of the lower animals, wherewith it became possible to join the organ of smell with the respiration in air breathing animals). (b) clinically in the protection against temperature, dust, microbes. (c) mechanically in the assurance of an axial current in each one of the air chambers, (demonstrated empirically for the nasal cavity by the experiments of Paulsen, Zwaardemaker and Franke, for the pharyngeal and tracheal chambers by experiments on a model). The air in the air chambers is at rest around this axial current or is moved in fixed ways through vortices always present in it.

Dr. Posthumus Meyjes asked how these experiments were controlled. Prof. Zwaardemaker answered that the experiments were made with doctors, assistants or officials of the laboratory. Dr. Gevers Leuven experimented also with strangers and compared nose and mouth with the air-bridge. The distribution of the air in the nose and mouth showed great

variation. A nearly equal passage is found for normal persons in the recumbent position.

Dr. Van Leyden wondered that Gevers Leuven found an enlargement of the nose in warm air; it does not tally with the sense of oppression one gets in a hothouse. Prof. Zwaardemaker did not know how to account for it, but the fact is true, as well for men, as for rabbits.

Dr. Burger could not agree, that these experiments demonstrate that the importance of the nasal breathing should be to assure the supply of a large quantity of air. The voluntary mouth breathing in the laboratory can not be placed on a par with the pathologic mouth breathing of adenoid patients. Prof. Zwaardemaker showed that a quiet respiration through the mouth in normal persons supplies the wants as well as a quiet nasal respiration. Of course the condition changes if the base of the tongue drops backward in sleep. These experiments do not settle this question.

Dr. Struycken asked what is the normal measure of the nose, on account of the advice not to make the nose too open. Doubtless a very open nose is very agreeable with emphysema, asthma, etc.—Dr. Gevers Leuven found an area of twice 30 mm. after examining 33 persons; which agrees pretty well with Kayser, who found an area of 40 mm. for healthy nasal cavities. For normal people therefore, 30 mm. on each side will be sufficient.—Dr. Struycken stated that the persons were examined while resting, but that a wider passage would be necessary after exertion. Dr. Burger said, that these experiments give no image of pathologic conditions, because the soft palate is lifted with voluntary respiration, although in unknown measure. Prof. Zwaardemaker stated that normal persons were examined, who dispose, in repose, of a certain surplus; Burger's objection was true, but the raising of the palate must not be considered too important; Gevers Leuven respired, lying on a bench, through the mouth for half an hour and longer without being troubled by the continuously lifted uvula.

Blaauw.

Results of the Paraffin Treatment of Ozena Patients.

DR. P. J. ZAALBERG (*Netherlands Laryng., Rhin. and Otol. Society*) treated 60 patients during the last year (since September); although the results are very recent, he believes that he will not be disappointed in the future. Twenty are cured, 35 very much better, 5 remained the same or have disappeared.

A case is cured when the fetor has disappeared and crust formation stopped. Amelioration means an occasional slight return of fetor, with little secretion, which can be controlled by nasal cleaning every 1, 2 or 3 days; the crust formation is here minimum. The failure is the consequence of the almost complete disappearance of the conchæ, which prevents injection, as the treatment of the septum gives no results. The results speak against Gruenwald's theory that ozena is nearly always caused by suppuration of the cavities. He had a couple of cases with suppuration of the ethmoid, where the paraffin injections made the ozena symptoms disappear, while the suppuration remained unchanged. His syringe is a simple one of metal, the canulæ long and thick, with a curvature at the end, which makes injection easier. He injects in the posterior part of the inferior concha after cocaineization; the middle concha is also treated. The number of injections changes, sometimes in one sitting both conchæ can be injected, sometimes they must be repeated 8 to 10 times. The injections are usually painless; the nasal surroundings are often swollen during the next few days, which is painful, and there is lachrymation if it is injected too far forward; these symptoms pass without consequences.

Dr. Burger treated 6 patients (5 women). The atrophy of the nasal mucous membrane was very considerable. The technic in these cases is difficult. The great resistance under the mucous membrane may make the injection impossible. Burger saw the paraffin escape along the needle; it also might happen that the needle perforates the mucous membrane and the paraffin is deposited in the nasal cavity; the form of the inferior concha may make it difficult, so that only the anterior part can be injected, but if a deposit is made here, a later injection is still more difficult. Injections, which succeeded, often were followed by reactions, e. g. pain in the nose, swelling of cheek and eyelids on the side of the injection, pain in the eye, hemicrania and lachrymation. These symptoms appeared on the day of injection or on the next day; in one case patient recovered only after 14 days. His results were very poor. Some found the secretion lessened after one or a few injections, but as the patients used *nosé* washes at home, not too much reliance should be placed upon this, because these favorable reports did not continue. Burger saw no cure nor amelioration in his 6 cases; he concludes that the far advanced atrophy of the mucous membrane was the cause, and therefore will take

milder cases, because it is demonstrated that the treatment is of no value in the severe cases of ozena. He injected paraffin, melting point 45° , at a temperature of 55° , with the syringe of Broeckaert or of Delaere. Affections of the nasal cavities were excluded as much as possible, in 4 cases by proof puncture of the antra.

Dr. Broeckaert distinguished 3 kinds of ozena: the light cases, with slight atrophy limited to the inferior conchæ, curable with 1, 2, 3 injections. In the average severe cases, a subjective amelioration always was perceptible. In the severe cases, the injection is useless and even dangerous, because much force must be used. A complication in one of 20 cases is thrombo-phlebitis of the facial vein, which can not be prevented and sometimes lasts two months. He advises not to inject too much paraffin at once, nor to use high pressure, nor to use paraffin warmer than 55° , always to inject first in the posterior part of the concha. Dr. Struycken had cures in 10-20% with injections of ordinary vaselin under the mucous membrane, one drop daily. The nose stays open but the symptoms of the ozena disappear. He saw no harm; he does not warm the vaselin, rather cools it. Dr. Moll saw in one case cure after 4 injections. Dr. Frederikse believed, in opposition to Zaalberg, that a suppuration of one of the cavities is often the cause of the ozena. One of the patients, demonstrated by Zaalberg, noticed for the first ozena symptoms, in his 18th year, that he smelled the fetor himself and relates that the secretion was chiefly one-sided. Frederikse supposed there was affection of one of the cavities. Another demonstrated patient says she uses only two handkerchiefs during the week, which argues against ozena. Dr. Zaalberg mentioned, in reply to Dr. Baeza, the examinations made by Doebeli (*Archiv. f. Lar. B.* 15) showing easy wandering through the cells of the mucous membrane in ozena, and thought that the paraffin injections change the nature of the mucous membrane.

Blaauw.

Transillumination of the Frontal Sinuses.

CLAVIS (*Archiv. für Laryngologie und Rhinologie*, Vol. xiii., No. 1) has examined frontal sinuses from 117 cadavers, both by the method of Voltolini, and by the more recent one of Arthur Meyer. He found both methods to agree fairly well with each other, but to possess no constant certainty in regard to the condition of the interior of the sinuses. For this reason,

he assigns a subordinate position to diagnosis by transillumination of the frontal sinuses, except where employed in connection with the method of air inflation, as suggested by Bresgen, where the latter results positively. If, for instance, a frontal sinus before inflation, appears dark by transillumination, and subsequently lights up, one may say, with reasonable certainty, that empyema exists. If, however, it remains dark after inflation, it is, in the first place, possible that air has not entered the sinus; secondly, the opacity may be due to a tumor, to absence or the small size of the sinus, or, as more frequently occurs, may be dependent upon the thickness of the bones. It is also possible that large ethmoidal cells, situated far forward, may occur in the frontal sinus, which may be illuminated, while the sinus itself, situated posteriorly, may be diseased. The writer recommends especially the employment of illumination after the air douche, in connection with subjective perception of light, during convalescence from acute inflammation.

Goodale.

The Pathologic Anatomy of Hypertrophy of the Lower Turbinate.

CITELLI, S., Turin, (*Archives für Laryng. und Rhinol.*, Vol. xiii., No. 1.)

Hyperplasia and hypertrophy of the lower turbinates are results of chronic inflammation, extending from the surface into the deeper tissues. All the structures of the turbinate, including bone, are more or less involved. The hyperplasia of the connective tissue passes eventually into a process of degeneration. The degeneration in such cases is not mucous or colloid, but consists in the formation of cysts, and is to a certain extent of hyaline nature. The different forms of hyperplasia and hypertrophy may be divided into four types: first, mixed, or fibro-angio-adenomatous; second, angiomatous, third, fibromatous; fourth, cystic or degenerative. Of these four microscopic forms, the two first correspond macroscopically to the diffuse hypertrophy, the third form to the papillary, and the fourth to the polypoid or degenerative type.

Goodale.

Bony Cysts in the Middle Turbinate.

HARMER, (*Archiv. für Laryng. und Rhinol.*, Vol. xiii., No. 2.) Bony cysts of the middle turbinate are somewhat uncommon, and are to be considered as a developmental

anomaly of the middle turbinate, probably congenital. Inflammatory irritations do not give rise to the cavities. The term "bony cyst" is to be employed only when the turbinate shows a distinct cystic expansion, not in all cases where a cell is found in the middle turbinate. The lining mucous membrane possesses a ciliated epithelium, is very thin and tender, contains a small number of mucous glands, and is usually loosely attached to the underlying bone. It shows therefore, close resemblance to the lining of the accessory sinuses, especially the ethmoid. Increase in size of the bony cysts is found usually only in a very slight degree, and is apparently not dependent upon inflammation, or polyp formation in the middle turbinate. The lining mucous membrane is usually free from inflammatory alterations. These conditions are to be distinguished from others, characterized by infection of the sinus and purulent secretion with closure of the channel of exit, under which circumstances, the bony cyst may exhibit rapid growth, dependent upon pressure from pus. These swellings are to be regarded as pathologic structures, distinct from the true bony cysts. The so-called mucocele of the middle turbinate is to be included in the same class as bony cysts. They show usually no material increase in size, except in the event of inflammation and stasis of their secretion, when they have the same pathologic significance as the empyema cysts. *Goodale.*

The Present Status of the Ozena Question.

GRUENWALD, (*Archiv. für Laryng. und Rhinol.*, Vol. xiii., No. 2). A number of focal suppurations (accessory sinuses, nasal passages and adenoid tissue in the epi- and mesopharynx) occur with the clinical picture of fetid crust formation in broad noses. The secretion is usually thin, generally without odor, at times, however, fetid in its fresh state, dries as a result of mechanical influences, especially through its adhesiveness, produced by infection with the bacillus mucosus of Abel, increased by the abnormal breadth of the nose. Atrophy, if not primary, arises through pressure, and the infectious influence of the crusts. The odor arises by saprophytic decomposition of the masses of secretion, kept in a half-moist condition by the abnormal adhesiveness. Whether the more serious character increases the tendency of the secretion to adherence and decomposition, remains to be determined. It is certain that general impairment of strength, depending on heredi-

tary causes, especially in family tuberculosis, favors the development of the initial focal suppuration, as well as the secondary processes of infection. The disease may also lead to general cachexia.

Goodale.

Deviations of the Nasal Septum. A Review of One Hundred Operations for Correction.

JOSEPH S. GIBB, Philadelphia, (*Journal American Medical Association*, Oct 29, 1904). Of the 100 cases 65 were treated by the Asch method, 23 by the Watson-Gleason operation, and 12 were spurs.

Of the Asch operations results were good in 47 cases, fair in 11, and 3 were failures.

Of the Watson-Gleason operations the result was good in 19, fair results were obtained in 3.

The author concludes there is no single operation suitable for all cases of deviation of the nasal septum. Each case must be a study unto itself, and the surgeon must decide the operative measure best suited to the individual case. The Asch operation is satisfactory in the large number of cases in which the cartilaginous septum alone is deflected. Osseous deviation and cartilaginno-osseous deviations are not suitable for correction by the Asch method. Deviations of both the cartilaginous and osseous septum offer the most difficult problem to solve, and no one operation meets every indication, but in many cases the Watson-Gleason operation, modified to suit the case, offers a good chance for success. Many cases of removal of spurs, either cartilaginous or bony, will accomplish the best result, and when this is the case, it is more desirable than the more formidable division of the septum. There are a certain number of cases which are inoperable. Perforations occur in about the same number of cases in all operations in which an entire division of the tissues of the septum is effected.

Richards

The Formation of Cysts in the Cartilages of the Nose.

ZARNIKO, (*Archives Internationales de Laryngologie*, Jan., Feb., 1905). The report of a cyst in the nose of a man of 61 years, which had existed for 20 years. There was no pain complained of, but marked facial deformity. Puncture with a fine trochar evacuated a considerable quantity of brownish transparent serum and caused an immediate disappearance of the tumor for five months, when the puncture was repeated.

The cyst subsequently refilled but the patient refused all radical measures for its cure. The affection is an exceedingly rare one. The author discusses the method of formation. He does not believe they are of the nature of retention gland cysts but arise in the cartilage, corresponding in effect to the serous perichondritis of Velpeau. The affection of the mucosa is then to be considered only an occasional cause, produced upon a cartilage predisposed to cyst formation.

Nasal Reflex.

L. REITH, Vienna, (*Monatsschrift für Ohrenheilkunde*, Jan., 1901) reports three cases of reflex nervousness, following an intranasal operation, in which tampons were used. The symptoms disappeared after the removal of the tampons.

Male, 25 years old. Purulent sinusitis, left nasal cavity. Sphenoid and frontal sinuses not involved. The anterior half of the middle turbinate was removed, the ethmoid cells were opened, and the nasal cavity packed. The patient was sent home. When he returned the following morning, he stated, that about two hours after the operation, he had a heavy feeling in one of his legs, which continued to the present time. On removal of the tampon the condition in the leg disappeared.

Female, 20 years old, with hypertrophied left inferior turbinate. The inferior turbinate was removed, the nose packed, and patient sent home. On the following day she returned and reported that she was uncertain in her movements, at times was dizzy and tottered when she walked. When the packing was removed the symptoms all vanished.

Male, 30 years of age, with marked hypertrophy of the middle turbinate. Middle turbinate was removed and nose packed. The patient walked home. About twenty minutes before he reached his home he became very dizzy. This dizziness continued to the next day, when he returned. It was present whether lying or sitting. About two minutes after the removal of the packing the head became free, the dizziness disappeared and patient could walk perfectly well.

The nasal lymphatic system is directly connected with that of the subdural and subarachnoid. It is possible that the above mentioned reflexes are due to an interference with the lymph and blood flow from the pressure of the intranasal packing.

Foster.

Postoperative Nasal Hemorrhage; Calcium Chlorid; Secondary Anemia; Rapid Recovery.

REYNOLD WEBB WILCOX, New York, (*American Medicine*, March 18, 1905.) The patient, a man of 25, was operated on July 8, 1904, by Dr. Frank E. Miller, the inferior half of the right middle turbinate, together with a small spur, being removed with snare and saw. Cocain and adrenalin chlorid were used. The healing was uneventful until the evening of the fourth day when profuse hemorrhage came from the right nostril. This hemorrhage continued at varying times in spite of repeated packings until July 20. In the meantime the patient became very anemic. The temperature on the second day of the bleeding went to 104.4°.

The case is reported particularly in regard to the treatment, which consisted of calcium chlorid 40 grains, given by the rectum after free hemorrhage. Adrenalin chlorid, morphin and ergotin were also used. Convalescence was established by July 25. Plugs were continued in the nose for nine days, the 12th to the 21st.

The calcium chlorid is used because it causes the blood to coagulate more rapidly, and often causes an arrest of hemorrhage. Its continued administration, however, is not effectual in keeping up a permanent condition of increased coagulability of the blood. The dose, 40 grains, either by mouth or rectum, given once daily will accomplish what is desired. For the relief of the anemia, iron-vitellin was given with good results.

Richards.

Remarks on Some Abuses in the Intranasal Surgery of To-day.

MACKENZIE (*New York Med. Jour.* and *Philadelphia Med. Journal*, Jan. 28, 1905.) A strong plea against the indiscriminate surgery of the nose and throat at present. Many operations on the nose are unnecessary unless the irregularity on the septum is of such a character as to cause serious obstruction and thereby cripple function. Most spurs met with are perfectly harmless. Small spurs may be actually productive of good to the individual. The author recommends as a substitute in suitable cases for operation upon the septum itself, removal of portion of the external and notably the inferior turbinated bone of the obstructed side (or portions thereof). Wholesale removal of the turbinated bodies is to be deprecated. Puncture of the antral wall is not always essential to a diagnosis of antrum disease and is capable of causing harm. It

should be followed by immediate operation where disease is found. The ground of all this reckless surgery rests in ignorance based on insufficient preliminary education. The time has come for a higher education of the student of laryngology. No short course of six weeks can possibly do this. *Harris.*

A Method of Demonstrating the Passage of Air Through the Nasal Fossae.

GLATZEL, LIEGNITZ (*Monatsschrift für Ohrenheilkunde*, January, 1904) uses rectangular mirrors, made of nickel plated sheets of zinc. On the sides of the mirrors are two projections which are used as handles. On each end there is a small piece of the mirror cut out to fit the upper lip. From this edge to the center of the mirror there are scratched upon the surface four arcs of a circle, at equal intervals, to enable the recording of the results. A mirror so constructed has four surfaces for exposure without cleaning.

The person to be examined removes any secretion in the nasal cavities by blowing one side at a time. A tight collar, or shirt band, interfering with the circulation of the neck, and thus the circulation of the turbinates, should be loosened. The mouth should be closed in a natural way and deep inspiration and expiration begun. During inspiration the mirror is placed, in a horizontal position with the cut-out part a little above the middle of the upper lip. During expiration moisture will collect on the mirror, like the wings of a butterfly. The expiration through a normal nose will produce two symmetrical cloudings of the mirror, extending to or beyond the fourth arc, and lasting from two to three minutes. If the clouding made by one nasal cavity is smaller than the other, or disappears more rapidly, then the patency of that side is less than the other. If the clouding extends to, or only a little beyond, the first arc, or is thin and disappears rapidly, then there is an obstruction to expiration on both sides of the nose; as in cases with adenoids, or when the septum is transversely placed from trauma.

Foster.

III.—PHARYNX AND MOUTH.

Hemorrhages after Adenotomy and Tonsillotomy.

P. TH. KAN (*Netherlands Laryng., Rhin. and Otol. Soci-*

ety) observed three cases of hemorrhage after tonsillotomy, so serious that it was necessary to use Mikulicz' compressor; one patient bled from both tonsils, so that two compressors were necessary; in one case a secondary hemorrhage occurred 13 days after removal of the compressor, but stopped spontaneously. Only a slight edema of the uvula and palate and a quickly passing paresis of one of the branches of the facial nerve were the consequences of the instrument. Kan prefers this way over the method of Heermann, in the presence of strong reflex motions. Kan also had three hemorrhages after adenotomy, which necessitated tamponing the naso-pharyngeal cavity. In one case the hemorrhage occurred directly after the operation, in one case two and in the third case six days after the operation. Five were private cases, and all in good physical condition. He prefers the tonsillotome for small, restless children.

Dr. Posthumus Meyjes warned against the use of instruments that are too sharp; he performs tonsillotomy with the cold snare with much success and considers the slow cutting off as of advantage on account of lessened danger of hemorrhage.

Dr. Mulder thought it better not to gargle after these operations.

Dr. Moll recommended Ruault's forceps for tonsillotomy.

Dr. Kan found that these frighten children on account of their size.

Blaauw.

Swelling of the Cervical Glands in Affections of the Pharynx.

STRUYCKEN (*Netherlands Laryng., Rhin. and Otol. Society*) treated in detail the swelling of the lymph glands, which are found accompanying the most different affections of the head, and gave some typical examples; bilateral excessive glandular tumors develop quickly with malignant tumors of the pharynx, while often the primary tumor is small and does not ulcerate; moderately enlarged glands around the jugularis ex- and interna, often also in the neck, are found with inflammation of the naso-pharynx; the glands in the posterior wall of the pharynx are swollen only exceptionally. A pronounced swelling of these glands can be found with sphenoiditis, caries of the cervical vertebræ and deep malignant tumors. A painful swelling of the glands, which accompany the sheath of the large vessels, is often found with the diplococci angina, which is very painful, and shows only a trifling, circumscribed redness of the faucial mucous membrane; this affection re-

mains not seldom subacute, and gives rise to intermittent rise of temperature while the connective tissue and the muscles around the glands are infiltrated; these glands are often softened in the center and contain a pure culture of diplococci. They can cause edema glottidis, and also vagus death. Struycken treated a few such cases, surgically.

Blaauw.

Angina and Phlegmonous Pharyngitis, Followed by Purulent Thrombosis of the Cavernous Sinus and Purulent Basillar Meningitis.

TOLLENS, Breslau, (*Archives of Otology*, Vol. xxxiii., No. 6.) This is a case of that which Senator first described as acute infectious abscess of the pharynx. A young woman was taken suddenly ill with high fever, a pain in the neck, difficulty in swallowing and severe headache. The right cheek presented a striking red swelling extending to the upper margin of the zygomatic arch and back to behind the right ear. Right catarrhal conjunctivitis. Pupils uniform and react readily. The pharynx is intensely red, without exudate. The right half of the soft palate is swollen and red but without fluctuation as is likewise the post-pharyngeal wall. The glands at the angle of the jaw are enlarged. The soft palate was incised without result. All symptoms were aggravated next day. Protrusion of the right eye ball with chemosis. The right pupil was larger than the left, but both reacted promptly. Two days later protrusion of both eyes and chemosis of both conjunctivæ. The swelling of the right side of the face has increased. The tip of the right mastoid is tender as well as the region of the emissary vein. The palate wound discharges thick pus containing streptococci in pure culture. The pharyngeal wall was incised without producing pus. Pronounced meningitis symptoms developed and patient died of general septicemia.

On autopsy the blood vessels of the pia on the convexity of the brain were congested. There was purulent basal meningitis. The cavernous sinus was thrombosed and the Gasserian ganglion surrounded by a purulent fluid. The right tonsil was as large as a walnut and soft on pressure. The mucous membrane of the tongue, pharynx and epiglottis was covered by a blackish-green exudate. There were small abscesses in the apices of the lungs. In the kidneys were many septic emboli.

The purulent inflammation presumably extended along the

delicate veins, which pass from the venous pharyngeal plexus through the base of the skull to the cavernous sinus.

Campbell.

The Cryptic Structures of the Hyperplastic Pharyngeal Tonsil.

GOERKE, B. M., Breslau, (*Archiv. für Laryng. und Rhinol.*, VOL. xiii., No. 1.) The formation of cysts in hypertrophied pharyngeal tonsils is frequently observed, and occurs more often in adults than in children. The anatomic structure of the cysts and their contents, vary with their origin and their situation. Such cysts arise usually through retention of the glandular secretion, and the times also as a result of other processes, such as extravasation of lymph into the glandular ducts, together with processes of proliferation and growth in their walls. These processes are the result of inflammatory conditions.

Goodale.

Adenoid Cachexia.

I. Examination of the blood in children before and after the removal of adenoid vegetations.

II. Does cyclic albuminuria frequently occur in children with adenoid vegetations.

TAKABATAKE, Nagasaki, Japan, (*Archives of Otology*, Vol. xxxiv., No. 1.) Author selected the 28th day after the operation to make the second blood examinations in a series of 50 children.

In 12 cases the quantity of hemoglobin was increased.

In 8 only there was an increase of red blood corpuscles.

In 4 a diminution.

The number of white blood corpuscles in all cases diminished after operation.

The polynuclear and the eosinophile cells were slightly increased, while the large mononuclear cells and the lymphocytes were diminished.

The general physical condition and body-weight increased except in one case which remained stationary.

II. Cyclic albuminuria occurs in children and youthful individuals of feeble constitution and retarded development more frequently in proportion with increase of other symptoms of feeble health; viz.: chlorosis, scrofula and dilated heart.

As adenoid children are usually feeble it seemed well to examine the urine in this series of 50.

Albumin was found present in only one and this did not

occur again after rest or after moving about. Cyclic albuminuria in the urine of otherwise healthy individuals occurs chiefly during the day and disappears on rest in bed at night.

The one positive case of the author shows such a slight percentage that its occurrence may be regarded as purely accidental.
Campbell.

Cartilage in the Pharyngeal Tonsil.

E. ZUCKERKANDL, (*Monatsschrift für Ohrenheilkunde*, Feby., 1904,) refers to the article by Reitmann regarding the presence of cartilage in the connective tissue of the faucial tonsils, and says that cartilage also occurs in the connective tissue of the pharyngeal tonsils.

He reports his findings in a pharyngeal tonsil removed from a lion. After hardening the tonsil was 4 mm. thick. It was composed of three layers—a superficial layer of adenoid tissue, a deep layer of connective tissue, and between them a glandular layer. The cartilage masses were irregular in shape, hyalin in character, surrounded with a perichondrium, and located in the glandular layer. The occurrence of cartilage in the pharyngeal tonsils of lions is not a usual thing. *Foster.*

Lithemic Nasopharyngitis Due to Systemic Disturbance.

J. A. STUCKY, Lexington, Ky., (*Journal American Medical Association*, Oct. 15, 1904.) By this term is meant that type of disorder having a close etiologic relationship to rheumatism, or the so-called lithemic diathesis, and has its origin in auto-intoxication caused by the absorption of by-products from the intestinal tract, or in the faulty metabolism occurring in the liver.

It may be defined as an acute congestive rather than an inflammatory process.

In these cases there is local manifestation of a systemic condition. The patient complains of always taking cold, sneezing, having a stuffy, full feeling in the head, one nostril always stopped up, copious and frequent discharge from the nose, greatly annoyed by accumulation behind the palate and crackling noise in the ear. In addition to these nasal symptoms, attention will be called to a stiffness in the throat, sensation of a foreign body. They complain of "catarrh."

Interrogation reveals that more or less constipation exists, that little water is drunk, that meats and sweets are freely

used, the skin is abnormally florid or muddy, and that there is an increase of indican in the urine.

There is no permanent relief until the treatment thoroughly eliminates the indican and the insufficient functioning of the large and small intestine is remedied and improper diet corrected. The gastric contents should be analyzed to see whether the stomach is at fault. Many of these cases have naso-pharyngeal annoyance either immediately or several hours after eating. If immediately, we suspect the trouble to be reflex gastric irritation; if several hours after, intestinal toxemia, due to indigestion.

The author regards local treatment as of little value except as a preliminary cleansing of the mucus. The first indication is to clean out the alimentary canal. The patient is put on restricted diet and plenty of water, an average of six ounces every hour. A dose of calomel and salol five or ten grains each is given, followed in six hours by a saline.

An hour before the evening meal the colon is filled and flushed with two or three quarts of soapsuds, by means of a thirty-inch double-eyed colon tube. Three or four hours later, eight ounces of warm olive oil are injected by means of an injector consisting of an ordinary nursing bottle with two openings, one at the top and one at the bottom. In the lower opening a suitable conical tube about 14 inches long is inserted full length. The upper opening is fitted with a perforated stopper containing a small tube, to which is attached an ordinary atomizer bulb.

This treatment is given four or five days continuously, then once or twice a week, marked relief being observed in the majority of cases. That the patient has one or more evacuations of the bowels daily does not prove the absence of retained toxic fecal matter. The effect of the colon flushings and oil treatment is: 1, mechanical, by softening of the scybulous masses; 2, the oil is broken up into fatty acids and glycerin, the absorption of the glycerin causing watery flow of bile from the liver.

Mild cases of lithemic naso-pharyngeal irritation can be relieved by alkaline cathartics.

Richards.

Stenosis of the Nasopharynx Secondary to too Strenuous Curetting for the Removal of the Adenoid Vegetations.

ESCAR, (*Arch. Int. de Laryng.*, Jan., Feb., 1905). Report of a case where some months previously a local practitioner had

operated without an anesthetic and apparently curetted all four sides of the pharynx. The operation was followed by much pain for three weeks. When seen by Escat, there was great difficulty in breathing through the nose and decided deafness. Examination of the pharynx revealed almost complete adhesion of the soft palate, a fine probe discovered a sinus leading to the naso pharynx.

Five months were required to permanently separate the walls, the author employing for this purpose a curved hook, under cocain. The adenoid growth lying attached to the vault was found untouched. The result as to hearing and breathing was good. Warning is given as to the dangers attending indiscriminate adenectomies at the hands of inexperienced men, not specialists, and the importance of care and skill in the performance of the operation emphasized.

Operative Treatment of the Faucial Tonsils, with a View to the Prevention of Cervical Adenitis.

ROBERT C. MYLES, New York City, (*Journal American Medical Association*, Oct. 29, 1904.) The author thinks that the cervical lymph nodes can be read with the fingers and may be considered as an index to pathologic conditions in the faucial tonsils; that rheumatism, septic infection, tuberculosis and the like may be traced to primary involvement of the tonsil, the microbes invading the tonsil through the crypts. The enlargement and surface irregularities associated with chronic hypertrophy greatly favor infection.

We should not be contented with the old method of tonsillectomy with the guillotine only, but should employ scissors, dissecting knives, traction forceps, wire snare, punch forceps or curette, each or all, as careful analysis may indicate in each individual case.

Richards.

Spontaneous Tonsillar Hemorrhage.

LEWIS S. SOMERS, Philadelphia, (*Journal American Medical Association*, Oct. 15, 1904) reports a case of spontaneous tonsillar hemorrhage in a woman aged 41 years, who had been ill for a week with peritonsillar abscess of the left side. This was her first attack. The abscess had discharged profusely two days previously. Dr. Somers was called at midnight for the first time, when the nurse said the patient was bleeding to death. She had suffered during the evening from great pain in the throat, and a few minutes before he was summoned,

was heard by the nurse groaning and strangling. It was then found that a column of blood was pouring from the mouth, a large basin being soon filled with bright arterial blood. The patient's clothing and bedclothes were soon covered with it, and a stream was still gushing from the mouth.

As forcible pressure as possible was made over the carotid artery of that side, but it was impossible to obtain proper illumination and so ascertain the vessels involved in the bleeding. With the unengaged hand forcible pressure was made by means of two fingers over the tonsil, compressing the pillars together, while a saturated solution of tannic acid was poured into the mouth, the hemorrhage diminishing sufficiently in amount to allow of this procedure. Strychnin and ergot were administered internally, and within fifteen minutes the hemorrhage had practically ceased. Fifteen minutes later the hemorrhage had entirely ceased and there seemed to be no further immediate danger.

Examination later showed that the abscess had destroyed the entire tonsil and in this way had involved several small vessels, while the main volume of blood was evidently derived from the artery of the anterior pillar of the fauces, through which there was a large ragged opening. No further bleeding took place.

Richards.

Sarcoma of the Tonsil.

J. COLLINS WARREN, Boston, Mass., (*Boston Medical and Surgical Journal*, March 9, 1905.) The tumor was on the right tonsil, about the size of a fist, and occurred in a woman 33 years of age, with a history of growth of three years' duration, much more rapid during the previous six months.

She was operated on January 5, 1904. An incision was made from the outer angle of the mouth vertically downward to the edge of the chin, whence it was directed backward at a sharp angle reaching to the level of the external auditory meatus. The cheek was then separated from the lower jaw and held back with a tenaculum. A blunt dissector freed the lower surface of the horizontal portion of the jaw from the soft parts; the bone was then divided a short distance in front of the ascending ramus with cutting forceps working in a groove made with a saw. Single hooks fastened into the cut ends of the bones were used to separate the fragments widely by dislocating the heads of the jaw from their sockets.

The tumor was found on inspection to be closely attached to

the thyroid cartilage. It was not difficult to shell it out from above, but its connection with the larynx necessitated the removal of the epiglottis and a portion of the glottis on the right side. The larynx was so much loosened from its connections by this incision that it had to be stitched to an opening in the wound and thus made fast to the edges of skin in the anterior portion of the wound in the neck. Fragments of the jaw were wired together and the wound closed with drainage from the floor of the mouth.

The patient made a good recovery and left the hospital on February 18. On June 13, a fragment of necrosed bone was removed from the neighborhood of the wire suture—the bone itself having firmly united. On November 1, the patient came again to the hospital to have the opening in the neck closed. This was about one and one-half inches in length, and during phonation the vocal cords were exposed and could be seen in motion close to the surface. The edges of the wound were refreshed under cocain anesthesia and two rows of sutures taken—one of catgut for the mucous membrane and one of silkworm gut for the skin. There was prompt healing by first intention. There had previously been some leakage through this opening during deglutition, but after this wound was healed, deglutition was performed without difficulty. The patient's health now appears to be all that can be desired, and inspection of the fauces shows no recurrence.

Pathologic examination showed the tumor to be a small round celled sarcoma, about half the size of a fist.

Richards.

Report of a Case of Acute Septic Inflammation of the Throat and Neck, in which the Edematous Swellings were Dispersed by the Use of Adrenalin Chlorid.

FRENCH, THOMAS R., Brooklyn, N. Y., (*Brooklyn Medical Journal*, February, 1905.) Inflammation began with a high grade of inflammatory activity in the fauces without edema, followed the next day with loud and increasing laryngeal stridor and edematous swelling of the epiglottis, arytenoid cartilages and aryepiglottic folds, with a temperature of 102° , respirations 27.

The treatment was a free application every hour of a 1-5000 solution of adrenalin chlorid by means of a tuft of cotton wound upon a curved applicator. By the end of the fifth application the laryngeal stridor had quite disappeared. The

applications were continued for several hours, the house physician sitting by the bedside of the patient the entire night. On the following day the edema had nearly disappeared, and although there was considerable congestion and infiltration of the tissues the lumen of the larynx was practically normal. Recovery after this was uneventful.

Dr. French thinks that this solution is capable of controlling edema of any mucous surface which can be readily reached with a cotton applicator or a spray from an atomizer. Where the swelling extends below the glottis, it is doubtful if the solution could be applied successfully except by intra-tracheal injections. A low tracheotomy would probably also have to be performed.

Richards.

Examination of the Nasopharynx by Indirect Touch. Aided by Explorers.

COURTADE (*Arch. Int. de Laryn.*, Jan. and Feb., 1905.) The majority of cases do not permit posterior rhinoscopy. Digital examination, valuable as it is, is open to the following objections:

1. The space is too small in very young children to permit it, while in adults and children from 15 to 16, the vault is too deep to allow the finger to reach it.

2. The examination is so disagreeable that it does not grant sufficient time for thoroughness as to size and seat of the adenoid growth.

3. Only one side of the pharynx can be reached by the examining finger and repetition is not desirable.

4. Disinfection of the hand is necessary and requires time in clinic practice.

5. Bites of the finger are always possible. Courtade has, accordingly, devised "explorers" (nature not given) of varying sizes which he claims removes all these objections.

He lays especial stress on the ability of the examiner to carefully map out the exact situation of the growth.

Harris.

IV.—LARYNX.

Energy of Singing.

PROF. ZAARDEMAKER (*Netherlands Laryng., Rhin. and Otol.*

Society) proceeds from a supposition of Rayleigh, according to which, under very favorable conditions, the acoustic energy equalizes the consumed energy. A well-known singer sang in the aerodromograph in the Utrecht laboratory. The air consumption for a certain song was 33 c. cm. a sec., for a staccato 50 c. cm. a sec. If the medium pressure in the trachea is 14 cm. water height (Roudet), the energy-consumption is for the song 0.45 mega-erg a sec., and 0.98 mega-erg a sec., for the staccato (a mega-erg is a quantity of energy equal to 1.42 gramecalory). The air coming from the mouth is supposed to possess no more energy, which is allowed, as a current can hardly be demonstrated and its energy does not surpass half an erg.

Blaauw.

A Case of Tracheal Syphilis.

POSTHUMUS MEYJES (*Netherlands Laryng., Rhin. and Otol. Society*) saw a 59-year-old carpenter, who gradually had become thin and oppressed with muscular action, swollen feet at night. His deceased wife had ten children, 8 of which died under one year, and 2 miscarriages. Lues denied. The dyspnea is audible and visible, the jugulum sinks in, the larynx does not move; the voice is husky. Heart, lungs and kidneys normal; a hard liver, margin palpable; pulse strongly arteriosclerotic, also the abdominal aorta. A large, scaling, suspicious papule on the back of the left hand. The cause of the dyspnea was found to be a scarlet tumefaction, nearly annular, under the rima glottidis, extending over nearly 2 c. cm. within the trachea. A narrow slit, the size of half the glottis, is left for respiration. The tumor gives a solid impression and is painless. Antiluetic treatment and rest diminished the dyspnea somewhat, although the stenosis remains. Dilatation with von Schoetter's tubes gave little result; the dyspnea increased. Cricotomy and high tracheotomy grade of inflammatory activity in the fauces without edema, were done under local anesthesia, while oxygen inhalations were of much benefit against the dyspnea. The speech remained intelligible with the canula. Patient received sublimite injections. Four weeks later the canula could be removed. The stricture had disappeared except a small prominence at the left side wall. The internal therapy was continued. It was also peculiar, that notwithstanding the strong dyspnea the larynx remained motionless, the typical symptom of stenosis within the trachea as described first by Gerhardt.

Dr. Brat advised Bleyer's tubes for such cases, as they could

be worn during the night. Dr. Muyderman gave the history of an analogous case of subchordal tertiary syphilis.

Blaauw.

Demonstration of a Cured Case of Radically Operated Carcinoma Laryngis.

DR. BURGER (*Netherlands Laryng., Rhin. and Otol. Society*) showed a patient, 63 years old, whose entire larynx was removed on Dec. 28, 1900. Patient is healthy and free from return; the trachea was sutured to the skin, the pharynx had been obliterated. Patient respires through his tracheal fistula, which remained wide open. Laryngoscopically, the free part of the epiglottis can be seen, nothing more. Patient had an instrument wherewith to bring the expired air from the tracheal fistula through the nose into the mouth; he did not like it for speaking. He can only speak with a little esophageal air, very indistinctly.

Dr. Burger then showed a case of double sided suppuration of the frontal sinus, operated after Kuhnt. Dr. Vermeij made an opening, size of a five-cent piece, in the anterior wall, followed by curetting and drainage on August 20, 1894. The wound was closed after 2 to 5 months. Then, repeated polypi formation, headache and suppuration of the nose. Burger operated on Dec. 29 last, found the opening, made nearly ten years previous, the same, granulations were present, which did not bulge out. The outer wall was removed, then a large communication with the other sinus was found, which necessitated the removal of the anterior wall of this one. A large part of the left sinus was replaced by a large ethmoid cell, which contained mucus and was removed entirely. On the left side a large communication with the nose was present; on the right side the ethmoid was perforated and a strip of gauze put in toward the nose. The wounds were closed, except over the right inner corner of the eye, where a drainage tube was left. Six weeks later, this opening also had closed. Suppuration of the nose had stopped on February 1st. Small polypi were removed from the ethmoidal cavity on March 30th, just one month later. The unbearable headache had disappeared. Burger is satisfied with the cosmetic result. Where the drainage tube lay, a sinking in of the skin is found. Burger considers it of importance for the future to close the entire external wound while making a large communication of the anterior part of the ethmoid with the nose, because it

is impossible to fill the most inferior, median part of the cavity with the soft parts of the forehead. A cavity remains here thus, which needs drainage toward the nose. Conservative operations are insufficient, because the cavity can not be overlooked.

Dr. Struycken advised paraffin injections made not too long after the operation, which improve the cosmetic result.

Dr. Moll had also a good cosmetic result after removal of the anterior and inferior wall. Dr. Burger had the same in a case of a small cavity with nice result; the cavity in the above related case was too large. *Blaauw.*

A Case of Carcinoma Laryngis.

H. VAN ANROOY (*Netherlands Laryng., Rhin. and Otol. Society*) was consulted at the beginning of April, 1903, by a man, who had complained of his voice for six months. He was 46 years old, had been free from diseases, also from lung affections and syphilis. Neither swallowing nor respiration gave trouble. On examination, the entrance of the larynx was found so narrow, that only a very small part of the vocal cords and, with phonation, of the swollen false cords could be seen, and it was amazing that no respiratory difficulties were present. The slow development of this somewhat uneven infiltration of the epiglottis, ligamenta aryepiglottica and regio arytenoidea, alone could explain the absence of stenotic symptoms. Condition the same for 6 weeks. In the beginning of June, the left arytenoid cartilage did not show movement nor did the left vocal cord. The absence of pain and of any lung process, and the local picture excluded tuberculosis. Neither iodid of potassium nor mercury had any effect. Prof. Pel was consulted in the beginning of June, and he also found it a very interesting case and thought it not improbable that it was a very slow growing carcinoma. Iodid of potassium was continued with inhalations of a weak tannin solution. Patient staid away till November; the dyspnea had increased, he looked pale and weak, and a stridor was plainly perceptible. The aditus laryngis was now a narrow slit; the epiglottis, the posterior laryngeal wall and the side parts, which stood out in both sinus pyriformes, all were much thickened and swollen, so that inspection of the larynx was impossible. At the left side of the larynx a small gland could be felt and the thyroid cartilage was somewhat sensitive on pressure. Tracheotomy had to be performed; patient died 24 hours later, suddenly;

no autopsy allowed. Inspection of the larynx revealed a deep ulcer under the epiglottis; a microscopic examination showed this to be a carcinomatous. *Blaauw.*

The Action of the Crico-Thyroid Muscles.

E. E. BARTH, Sensburg, (*Archiv. für Laryng. und Rhinol.*, Vol. xiii., No. 1.) The crico-thyroid muscle usually contracts in such a manner as to draw up the cricoid cartilage to the lower margin of the thyroid. In order to accomplish this, the thyroid cartilage must necessarily be fixed. The fixation of the thyroid cartilage is always a relative one, being dependent upon the fixation of the hyoid bone. If the muscular apparatus, which fixes the hyoid bone, relaxes, the thyroid cartilage is thus drawn down to the cricoid, by the action of the crico-thyroid muscle. The hyoid bone follows this movement of the thyroid cartilage, and comes forward simultaneously. By the movement of the thyroid cartilage and the hyoid bone downwards and forward, the sagittal diameter of the hypopharynx, and the distance between the posterior half of the base of the tongue and the palate, is enlarged. This enlargement improves the conditions which favor resonance and conduction of sound waves, which pass upward from the larynx. In consequence of the relaxation of the muscles governing fixation of the base of the tongue, phonation is accomplished with a less expenditure of strength. The production of tones with a thyroid cartilage directed downward, favors the hygiene of the sound apparatus, and is to be employed as a curative measure in functional disturbances of the voice. It is of fundamental importance in teaching singing and speaking to produce the sounds with relaxation of the fixators of the hyoid bone, and with corresponding lowering of the thyroid cartilage. *Goodale.*

Intubation, Including a Report of Some Unusual Cases.

RUSSELL SHURLY, Detroit, Mich., (*Journal American Medical Association*, Oct. 29, 1904). To intubate properly the patient should be held as if hung from the head; the tongue drawn well forward. In cases of spasm of the glottis, the tube should be held in place until the patient takes a deep inspiration. No larger tube than necessary should be used. Force is only to be condemned. Hemorrhages, syncope, false passages and other traumatisms are unnecessary. Gentle, firm pressure may be required to force the tube through a sub-

glottic obstruction into position after the obturator has been removed.

Where antioxin is given, the tube is usually worn from two to three days. In private practice the string should be left on the tube.

In private practice he advocates early intubation with removal of the tube at the beginning of the fourth day.

Richards.

Hemorrhage of the Larynx.

JOHN E. RHODES, Chicago, (*Journal American Medical Association*, Oct. 29, 1904). In treatment of this condition, rest of the voice is the most important item. Internal remedies are to be used for the quieting of any cough, and remedies like ergot and stypticin for the local effect on blood vessels. Astringents may be used topically, such as mild solutions of silver nitrate, perchlorid of iron, alumnol and the zinc salts. The author has found adrenalin 1-1000 to hasten the absorption of exudates. No harsh methods are to be used, and only the mildest of applications, as special stimulation is not required.

Abstracts of all the cases reported in literature accompany the article.

Richards.

Cancer of the Larynx.

SIR FELIX SEMON, London, (*Medical Record*, November 5, 1904,) thinks that the still prevailing notion that malignant disease of the larynx is from the first attended by grave constitutional symptoms, ought to be completely eradicated, and that the attention of the profession should be drawn to the fact that there are no more promising cases for radical operation than those in which the disease is at first manifested by nothing else than by extended hoarseness occurring without any apparent cause in middle-aged and elderly persons.

The clinical diagnosis should be made at the earliest possible moment and should be arrived at from the history and subjective symptoms of the case, from laryngoscopic examination and from accessory circumstances of importance so far as these will aid. As, however, this method is by no means perfect and occasionally mistakes occur in the practice of those most experienced, this clinical diagnosis ought, whenever possible, to be confirmed before any radical operation is undertaken, by the intra-laryngeal removal and microscopic exami-

nation of a fragment or fragments of the new growth. The patient should, previous to this examination, give his consent to immediate radical operation provided the microscope confirms the clinical diagnosis. As the microscope is by no means infallible, if its evidence be negative or inconclusive, the intra-laryngeal removal and microscopic examination of fragments should either be repeated, if necessary, several times, or if the clinical symptoms do not warrant postponement, exploratory thyrotomy should be undertaken.

The intra-laryngeal method is unsuitable for the radical removal of malignant new growths of the larynx.

Subhyoid pharyngotomy is applicable only in a very small number of cases.

Thyrotomy, if undertaken in suitable cases and sufficiently early, and if properly performed, is an ideal operation in intrinsic cancer of the larynx.

Hemi-laryngectomy comes into question only when it is found after opening the larynx that thyrotomy will not suffice. The tributary lymphatics may be removed even if apparently not diseased.

Total laryngectomy is to be reserved for extrinsic, and for those cases of intrinsic cancer in which both sides of the organ are affected and where the disease has proceeded too far to be eradicated by milder measures. It should be accompanied by removal of the laryngeal lymphatics on each side of the neck.

The statistics reported by Sir Felix are exceptionally good, twenty thyrotomies having been performed, with or without removal of small fragments of cartilage in cases of undoubted malignant disease of the larynx, with nineteen recoveries; two quite doubtful recurrences, and one death. In one of the recurrences the patient has remained perfectly well, and in the other it was found that the operation had not been extensive enough and a second thyrotomy was performed within two months from the first. After the second operation the patient has remained well.

He is convinced from his personal experience that no recurrence need be feared if the patient remains well for a full year after operation. Of the seventeen patients who permanently recovered from the operation, three died several years afterwards from affections altogether unconnected with the original disease. The remaining fourteen are living and well.

Richards.

An Interesting Case of Tuberculosis of the Larynx.

GRIFFIN, HARRISON E., New York, (*Medical Record*, December 11, 1904.) This patient had three attacks of laryngeal tuberculosis, every attack running into the third stage, namely that of ulceration, with rapid recovery every time he left New York City. The internal treatment consisted of a creosote preparation and one-twentieth of a grain doses of morphin in tablet form, repeated every one to five hours to keep the cough in abeyance.

The author thinks the throat should be treated as little as possible: that any violent or rough spraying into the larynx tends to inflame and spread the ulceration. He believes in keeping the larynx quiet until the ulceration is healed. He has found morphin in small doses, often repeated, with an occasional large dose to quiet a paroxysm of coughing, to be less objectionable than any other drug. *Richards.*

Nomenclature of Congenital Stridor

MASSEI (*Arch. Inter. de Larynx.*, Jan. and Feb., 1905.) According to Massei the majority of the lesions described under the name of congenital stridor are wrongly named. Spasm of the larynx of centric origin, compression of the thymus cicatricial bands, laryngismus stridulus (idiopathic and the result of adenoid vegetations), nasal reflexes and all similar conditions are not rightly called congenital stridor.

Stridor has a characteristic sound which resembles the croaking of a frog—heard only on inspiration. It can disappear when respiration is quiet and persists during chloroform anesthesia but ceases some after intubation. It appears at birth or a few days after and lasts from eight to twelve months. It may disappear spontaneously: although painful it produces no grave disturbance of respiration. Two theories alone can account for it—either a central lesion or congenital defects in the larynx vestibule. The author inclines strongly to the latter. Sutherland and Lack have succeeded in seeing the larynx in several cases.

Massei has practiced the touch examination in eleven cases and confirms the results of their examination. In all there was a malformation of the vestibule of the larynx. The epiglottis was poorly developed on its free side—resembled a large nut—was scarcely movable. The aryteno-epiglottic folds were short and with the two arytenoids approached the median line. The stridor proceeds not from the malformed

épiglottis but from the coming together of the aryteno-epiglottic folds. All his eleven cases confirm this and permit two facts to be clearly drawn.

1. There exists an actual congenital malformation of the larynx, limited to the region of the vestibule, capable of interfering with respiration.

2. A faulty conformation of the laryngeal orifice consisting of a narrowing of it to a crack suffices to bring on a characteristic sound known as *congenital stridor*. *Harris*.

V.—MISCELLANEOUS.

A Case of Struma Vasculosa.

ZAALBERG (*Netherlands Laryng., Rhin. and Otol. Society*) saw a girl of 20 years, who had found her neck becoming thicker after a fright, together with ocular changes. The diagnosis "Morbus Basedowii" was easily made; the exophthalmus was more pronounced on the left side. The patient felt a murmur in the neck; a finer motion, which was easily recognizable as a fremitus with the fingers, was found with the pulsation. A marked systolic sound was heard on auscultation. No obvious tremor; the skin became rough, and wrinkled and thicker in some places, chiefly on the knuckles; no changes visible with the laryngoscope.

Prof. Pel warned against treating morbus Basedowii with thyroid preparations; they are as oil to the fire; rest and a bland diet are the chief treatment; bromides are sometimes useful; galvanisation of the sympathetic in the neck is often very effective. Dr. Kan related a case, where Dr. De Bruine Groenevelt removed the entire sympathetic in the neck on the left side with much success; the exophthalmus on that side has as good as disappeared and the left radial can be felt no more *Blaauw*.

The Diagnosis of Aneurysma Aortae.

PROF. P. K. PEL (*Netherlands Laryng., Rhin. and Otol. Society*) says that Traube discovered in 1860 the left sided recurrens paralysis accompanying aneurism of the aortic arch; he finds, however, that the Oliver-Cardanelli symptom (1878), which has higher value, is less generally known. The

trachea must first be distended by lifting of the larynx (cart. cricoidea) with thumb and index of the right hand, while the ulnar side of the hand rests on the thoracic wall; the patient must keep his head a little backward and to the left and keep the mouth shut. Pel observed the rising and falling movement of the larynx, isochronal with the heart beat, also when blood in the aneurismatic sac was coagulated. Sometimes it can be seen at a distance. Four patients were shown with this symptom, while in only one was the left vocal cord paralyzed.

Blaauw.

Chromophotography of the Vocal and Sound-vibrations.

STRUYCKEN (*Netherlands Laryng., Rhin. and Otol. Society*) made use of the free fall to exclude all noise while experimenting; the membrane or median border, which takes over the sound-vibration, is photographed with a 100-times enlargement. The limits of the images are then sharp to $\frac{1}{4}$ m. m., so that amplitudes of 2.5 m. are still clear. The light line perpendicular to the vibration-surface is 1-10 m. m. broad, the velocity with which the negative falls is 1700 m. m. a second; the acceleration can be measured from two succeeding waves and the correction easily applied. With concentrated sunlight photographs are easily taken; 17,000 moment-photographs are taken a second, so that tones with only 4000 vibrations a second are demonstrable. The results show (1) that the earlier curvatures of gramophone and phonograph are much more complicated than the ones of the speaker, (2) that observations of periods, etc., must be right. Struycken found also that taking a number of curves of plain tones, the vibration-numbers of which are related as 1-2-3-4-5, etc., and combining these, the new curve shows the geometrical peculiarity—if the phases are taken equal—that always an abscissa can be found, which divides it into two parts, which form each phantom. If the phase is removed $\frac{1}{4}$, then an ordinate can be drawn with the same result. This does not obtain with the vocal curves which are still analyzed according to Fournier's problem, and Hermann neglected, as without much significance, the phase-moving in his second publication.

Blaauw.

The Effect of Radium Irradiation.

W. POSTHUIS MEYER (*Netherlands Laryng., Rhin. and Otol. Society*) demonstrated patients treated with radium. (1) Miss V., suffered with nasal lupus, externally in different foci.

internally visible as lupus granulations, two centimeters deep in the right nasal duct. The usual therapy had little success. From March 15 to April 14, patient was irradiated daily with 25 m. gr. radium bromid (20,000) units placed in the nose. Began with 2 minutes, later 10 minutes. From April 14-24 treatment twice a week for 20 minutes. During the first days, some hours after the irradiation, a slight excitation for sneezing, and slight dullness in the head. After 8 treatments, the external nodes began to vanish, while the granulations in the nose began to flatten and pale only after 3 weeks. End of April, the nose was apparently cured externally, with small red patches, with internal progress. Treatment continued. (2) Patient suffered from lupus of the right nasal wing ex- and internally for 3 years, introitus nasi of the right side full of granulations as far as the aperture, somewhat less on the left side. The septum is perforated. For 4 months the nose-point was affected. The usual therapy had no result, and the process was progressing. From March 22 to April 8 daily treatment, from 2-10 minutes, in the right nostril. The result was flattening of the external foci, while the internal granulations become flat and pale, also on the left side. From April 8 to 22 treatment twice a week, 10-20 minutes. Steady amelioration, the nose point is apparently cured, the nose wing on the way; the formation of crusts, before treatment very bothersome, has decreased. (3) Miss.—suffered from double-sided nasal lupus internally for years, the nose point is changed for about a year into a thick nodulous mass. On the face, good sized, scattered foci of lupus. The usual treatment had very little success. From March 29 to April 5, daily treatment for 5-10 minutes, in the right nostril. From April 1 to 4 with two radium tubes. Swelling and redness of the nose point increased, also the obstruction in the right nose; on the right side exacerbation of an old dacryocystitis. The reaction passed off in 4 days. April 11, 15 and 19 illumination for 10-20 minutes, again followed by some reaction. The effect was only a small reduction of the external lupus foci. Two ozena patients also were treated; after one week diminution of the secretion especially in the treated side of nose. The illumination began with 2 minutes, increased to 9 minutes. The local reaction was very little, only some dullness in the head in the evening. Conclusion: do not use radium daily and for a short time but sporadically and until a definite reaction occurs, then wait a good while.

Dr. Delsaux advised the use of adrenalin on the mucous

membranes because the activity of radium increases; he had important improvements in two cases of carcinoma laryngis and a complete cure of cancer of the external nose after 10 seances of 5-10 minutes. Dr. Brat had small success with lupus, good with carcinoma. Dr. Posthumus Meyes stated that radium can be examined with the electroscope; his cases, which showed an intense reaction after a longer period, were treated with pure radium; the dilution according to Curie, which he used, is innocuous. Dr. Delsaux described the simple way of dosage with an aluminium disc, which gradually thickens; an opening closed with a silver plate forms the zero point of the instrument, being non-transparent. The thickness of aluminium is determined, the shade of which agrees with that of the silver plate and the penetrating force of the rays is estimated according to the number of layers of aluminium, which let the light pass.

Blaauw.

Reflex Apnea and Cardiac Inhibition in Operations on the Respiratory Tract.

W. G. B. HARLAND, Philadelphia, and WILLIAM HARMAR GOOD, Philadelphia, (*Journal American Medical Association*, Oct. 22, 1904.) Reflex inhibition of heart and respiration is caused in the following way: Afférent impulses, following irritation of the trifacial and sensory branches of the vagus (superior laryngeal and pulmonary), are carried to the cardio-inhibitory center in the medulla. This center is thrown into greater activity, and strong inhibitory impulses are sent to the heart. At the same time the respiratory center is so acted on as to cause a cessation of respiratory movements, until the accumulated carbon dioxid again drives it into action. The consequent inflation of the air vesicles of the lungs then reflexly lessens the activity of the cardio-inhibitory center. (*Sitz. d. k. akad. Wissensch.*, Vol. lxiv., p. 11) and in this way inhibition is overcome.

Reflex inhibition is noted in operations on the nose. In operations on the septum quite frequently reflex inhibition will cause a patient to suddenly feel faint and "lose his nerve," although, the tissues being cocaineized, he experiences no pain. Doubtless many of the deaths occurring in primary anesthesia can also be attributed to this cause.

The rhinopharynx is very sensitive to inhibition. In the removal of adenoids a marked slowing of the pulse almost invariably occurs when the instrument—forceps, curette or

finger—is introduced behind the soft palate. Particulars are given which illustrate this.

It has been shown by Crile that irritation of the larynx, forcible dilatation of the pharynx and violent traction on the tongue will each cause reflex inhibition and even death.

Electrical irritation of the pulmonary vagal fibers has caused marked cardiac inhibition.

This condition of reflex inhibition cannot be prevented in every case. The only drug given internally that theoretically is of value is atropin, since it paralyzes the peripheral cardio-inhibitory ganglia in the heart, thus preventing cardiac inhibition. It must, however, be administered early and in full dose to insure absorption before ether is given or operation begun.

A preliminary spray of 1% cocain, with 1 to 10,000 adrenalin chlorid, sprayed into the nose and throat lessens the tendency to reflex inhibition. The treatment varies with the severity of the symptoms. Temporary withdrawal of the cause of irritation usually suffices. In severe cases atropin, even if given hypodermically, is too slow, as ten or fifteen minutes will elapse before it is absorbed. The prone position, artificial respiration, and gentle traction on the tongue are to be at once resorted to, followed by inflation of the lungs by mouth to mouth insufflation or with a bellows, keeping the lungs distended for five seconds, and repeating until the patient is revived.

Richards.

Periodic Hemorrhage of the Upper Air Passages.

BAUMGARTEN (*Arch. Int. de Laryng.*, Jan. and Feb., 1905.) Up to recently we were acquainted only with periodic hemorrhages from the nose. All other hemorrhages were supposed to proceed from the lungs. The laryngoscope has changed all this. Puech stated in 1863 that vicarious hemorrhage occurred 32 times from the stomach, 25 times from the breast, 24 times from the lungs, 18 times from the nose. Of the 24, from the lungs, we would recognize many today by means of the laryngoscope as arising in the upper air tract. Menstruation is to be regarded as a depletion of the organism through the uterus. Certain very vascular areas exist there which cannot resist a lateral pressure. The phenomenon does not occur if there is any defect in involution or otherwise in the uterus as when the veins are too deeply seated or when the lateral pressure is not sufficient. If there are vascular points

on mucous surfaces elsewhere, as in the nose, the hemorrhage will occur at the point of least resistance.

In 250 cases of periodic bleeding, 10 came from the nose. Baumgarten divides such hemorrhages into the following classes:

1. Those occurring before the beginning of menstruation. These did not occur in young girls so much as in older women, very anemic, where menstruation had been retarded. It came from the nose, was unilateral, moderate in severity, and was followed in a few weeks by normal menstruation. It is not wont to be repeated more than three or four times.

2. Those occurring in place of menstruation. Such cases are rare. There is usually some uterine trouble. They proceed most commonly from the nose and are unilateral and of moderate severity as a rule.

3. Those occurring during menstruation: (a) before menstruation; most cases of periodic hemorrhage belong to this class. It proceeds the normal flow directly. Sometimes the subjects are anemic and at other times they are healthy women. Menstruation is delayed a few hours. The bleeding was usually a unilateral epistaxis of moderate severity—but other sources have been detected as from the larynx. (b) Those occurring directly during menstruation. These also are often seen and come most often from the nose.

4. Those occurring during pregnancy. These proceed from the nose and only during the first half of the pregnancy. The first time it is slight but the second or third time more severe.

5. Those occurring during the menopause. They seem to occur more frequently at this period. Most often where the change of life is early. At this time a dry catarrh of the nose and throat is common and tends to favor the hemorrhage. Epistaxis is most frequent and is wont to last longest—sometimes a year. The attacks vary in severity even in the same person. Dry catarrh associated with crusts greatly aggravates the intensity of the hemorrhage.

Harris.

BOOK NOTICES.

Traité Elementaire et Practique des Maladies de la Gorge, du Pharynx et du Larynx par le Dr. E. J. Moure, chargé du Cours de Laryngologie d'Otologie et de Rhinologie à la Faculté de Médecine de Bordeaux, Paris, 1904, Octave Doin.

In the introduction of this latest work of Prof. Moure, he states that it is in effect a second edition of his book which appeared in 1890, to which he has added chapters on the pathology of the tonsils, palate, pharynx and lingual tonsils. To consider it from this view-point alone is unfair for although the first work was a creditable one in the light of the knowledge of the time, the last is much superior in every particular.

The anatomy, descriptive, histologic and embryologic is specially clear and comprehensive and the pathology is in keeping with the latest investigations. The chapters devoted to the tonsils are well conceived and presented, and the illustrations are most effective. Four hundred pages are devoted to the larynx, forming a treatise, ample for any general practitioner and sufficiently extensive to justify the attention of a laryngologist.

Saunders' American Year-Book for 1905.

The American Year-Book of Medicine and Surgery for 1905. A Yearly Digest of Scientific Progress and Authoritative Opinion in all branches of Medicine and Surgery, drawn from journals, monographs, and text-books of the leading American and foreign authors and investigators. Arranged, with critical editorial comments, by eminent American specialists, under the editorial charge of George M. Gould, A. M., M. D. In two volumes. Volume I, including General Medicine; Volume II, General Surgery. Two octavos of about 700 pages each, fully illustrated. Philadelphia and London: W. B. Saunders & Co., 1905. Per volume: Cloth, \$3.00 net; half Morocco, \$3.75 net.

The Surgical Volume of this well established Year Book con-

tains the ear, nose and throat section, under the editorship of D. Braden Kyle and J. Leslie Davis.

Fifty-eight pages are devoted to this department, affording a fair opportunity to detail its progress during a year. The authors have accomplished the object most satisfactorily without sacrificing important advances on the score of brevity. In fact they have presented in a well-written text a serviceable treatise which should be read by all laryngologists and otologists.

The Modern Mastoid Operation.

BY FREDERICK WHITING, A. M., M. D., Professor of Otology, Cornell University Medical College; Aural Surgeon to New York Ear and Ear Infirmary; Surgeon to St. Bartholomew's Clinic, etc. Illustrated by twenty-five half-tone and twenty-three key plates made from original drawings. P. Blakiston's Son & Co., Philadelphia.

This very excellent work of 353 pages gives in a detailed form the symptomatology, pathology and surgical treatment and after treatment of suppurative mastoiditis. The plates are of exceptional merit and the whole abounds with practical hints, gleaned from the author's personal experience.

The first chapter deals with the history of mastoidectomy from its inception to the classical operation of Schwartze. His own operation which he calls, "The complete mastoid operation," differs from the classical one in two features; first, it is a flap operation, and secondly, it requires the complete extirpation of the mastoid cells, whether apparently diseased or not. He regards the disease as an acute suppurative osteomyelitis. His technique is as follows:

A curvilinear incision is made one quarter of an inch behind the auricle. A second incision is made perpendicular to this, at the level of the meatus, one inch in length, directly backwards. The flaps are reflected and the periosteum is elevated with as little injury as possible. A groove is made with a gouge, starting at the supermeatal triangle as far down as the tip, skirting the brim of the bony meatus. The spongy bone is scooped out with a curette and then grooves parallel to the first are made, followed by scraping out of the spongy

bone with the curette. The antrum is next opened, and then the mastoid tip is removed by the rongeur.

The next step is the removal of the cell lying over the sigmoid groove. The author details the treatment necessary if the sinus is injured. The cells at the posterior root of the zygoma are removed and the wound cleansed with a 1-5000 solution of sublimate. The angles of the wound are closed with sutures. A piece of fenestrated rubber tissue is placed in the bony cavity and upon this is loosely packed strips of iodoform gauze. Over this are placed loose layers of iodoform and sterile gauze and cotton, and then a bandage. The dressing is changed at the end of 24 to 36 hours, with the omission of the rubber tissue. The gauze must be placed loosely. The author considers at length the various incidences that may arise during healing.

The author claims that there is little or no deformity by this method, in spite of the extensive excavation of the operation. He gives full credit to Gruening who modified the Schwartze operation by removing the pneumatic spaces and diploic cells at the posterior root of the zygoma.

This historical portion of the work is particularly instructive, and the typographical features and illustrations are of the highest modern standard. Altogether the book exhibits the author's operation upon the mastoid in successive steps interestingly and lucidly described and logically correlated.

Atlas and Epitome of Diseases of the Mouth, Pharynx and Nose.

BY DR. L. GRUNWALD, of Munich. Second edition, revised and enlarged. Authorized translation from the German. Edited, with additions, by James E. Newcomb, M. D., Instructor in Laryngology, Cornell University Medical College; Attending Laryngologist to the Roosevelt Hospital, Out-Patient Department, and to the Demilt Dispensary, New York City. With illustrations on 42 lithographic plates, and 41 figures in the text. Philadelphia and London: W. B. Saunders & Company, 1903.

As in other volumes of Saunders' Hand Atlases, the salient feature of the work is an abundance of excellent lithographs. In the present instance, the plates are faithfully executed and make the best possible substitute for direct clinical observation and instruction.

In this, the second edition, a number of alterations from the first have been made. The text, in addition to descriptions of the plates, contains complete case histories of the patients from whom the plates were taken. Several histologic plates have been added.

The last half of the book is devoted to a succinct discussion of diseases of the mouth, pharynx and nose, including anatomy, physiology, pathology and treatment. A few of the simpler surgical procedures are described.

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XIV.

DEFLECTIONS OF THE NASAL SEPTUM; A CRITICAL REVIEW OF THE METHODS OF THEIR CORRECTION BY THE WINDOW RESECTION, WITH A REPORT OF
116 OPERATIONS.

OTTO T. FREER, M. D.,

CHICAGO.

In this article I again describe my methods of operation as further experience has improved them and contrast my work with that of others; for since the appearance of my last paper, the "Window Resection," (*Journal of the American Medical Association*, December 5th, 1903) several articles on the submucous resection of deflections of the septum have been published. The most complete of these is that of Killian (*Die submucoese Fensterresektion der Nasenscheidewand*, *Fraenkel's Archiv fuer Laryngologie*, Vol. 16, page 362, 1904), but Hajek (*Bemerkung zu der Krieg'schen Fensterresektion*, *Fraenkel's Archiv fuer Laryngologie*, Vol. 15, page 45, 1904), Menzel (*Zur Fensterresektion der Verkruemmten Nasenscheidewand*, *Fraenkel's Archiv*, Vol. 15, page 48, 1904), Leon

E. White (Resection of the Nasal Septum, Boston Medical and Surgical Journal, Vol. CL, page 419, April, 1904), Weil. (Ueber die submucoesen Resektionen an der Nasenscheidewand, Fraenkel's Archiv, Vol. 15, page 518, 1904), Zarniko, (Ueber die Fensterresektion der Deviatio Septi, Fraenkel's Archiv, Vol. 15, page 248), Erhard Mueller (Zur Technik der Fensterresektion, Fraenkel's Archiv, Vol. 15, page 312) and Spratt (The Removal of Septal Spurs and the Correction of Deviations of the Septum, American Medicine, May 7, 1904) have also written important papers on the subject.

The Nature of the Deflections Encountered.—The number of submucous resections of deflections of the septum performed by me to the present time is 116. Ninety-six of my patients were males, 20 females; a disproportion in accord with general experience. Sixty-seven were young adults, 20 were middle aged; 23 cases were between 12 and 17 years of age and 6 were young children, two of them eight, two nine, one ten and one eleven years old. Fifty-six of the deviations were in the left naris and 52 in the right, an inconsiderable difference. Eight deflections were sigmoid horizontally and obstructed both nares at the same time. In twelve patients the deflection was so extreme that the septum applied itself along nearly its whole length to the lower and middle turbinated bodies, causing obliteration of the nostrils. In these cases the operation to create practically a new nasal fossa.

Only 41 of the deviations were purely cartilaginous, 66 were composed of bone and cartilage, while 9 were entirely bony. The majority of the deflections, 66, were double-angled, of the type which presents a distinct vertical angle (Fig. 1 and 2) in the cartilage extending in rare cases up into the perpendicular plate, and a horizontal angle beginning commonly in the cartilage and extending backwards and upwards, usually along the superior border of the vomer, in the form of a wedge, the crista nasalis inferior (crista incisiva) and the vomer curving outwards above the nasal floor to form its lower plane. On the concave side in the double-angled deflection is seen a trough with V-shaped bottom ascending upwards and backwards, corresponding to the horizontal angle on the convex side, while the vertical angle, which usually juts out strongly on the side of the convexity of the deviation, is generally merely indicated by a gentle depression. Another type of angular deviation which I call the crest-like deflection, appeared 22 times among

my cases. In this class the vertical angle is absent, there being merely a horizontal angle not differing from the one just described. It is this variety of deviation that is commonly sawed off as a "ledge, crest, ecchondrosis or exostosis" under the impression that the septum is plane or nearly so on the other side, for the concavity may not be seen because hidden deeply in the naris, but more often it is simply not looked for.

The insight into the septal skeleton, given me by my resections, has convinced me that solid crests or ledges resting upon a plane septum or even upon the summit of a deviation are much rarer than evenly hollowed out deflections, the acute angle of whose apex simulates a solid prominence. Among all of my deflections but 6 possessed noteworthy crests as a complication. Personal association with operators has shown me that the impression prevails that solid ledges arising from a straight or slightly deviated septum are frequent, and under this impression the summit of deflections is sawed off, leaving the mass of the deviation to continue to obstruct the naris or else, if the saw penetrate deeply, a perforation is made.

The posterior part of the horizontal angle of deflection is often visible by posterior rhinoscopy and is seen to extend near or even up to the posterior border of the vomer. (Fig. 3.) The latter, however, almost always stands vertically in the centre. Figures 4 and 5 show deflections in which this was not the case. One of these patients had not only marked deflection of the entire septum but also a congenital bony atresia of the choana, shown in the drawing.

Eight of the deflections were bowed or C-shaped horizontally and vertically. Bowed deflections are frequently extreme, begin far in front and often look like a red tumor projecting into the nostril. The vertical angle is replaced by a rounded bulging of the front of the septum into the obstructed naris, usually beginning at the anterior inferior free border of the quadrangular cartilage, which projects across into the opposite nostril. The bowed deflections are apt to extend far back into the bony septum, the bony part of the deviation usually presenting the typical horizontal angle described.

Ten of the deviations were of such an irregular form that they could not be classified. In two of these the vomer was bent horizontally upon itself in its posterior half, producing an acute angled vertical deviation that projected transversely across the naris, crowding into the lower turbinated body

(Fig. 6 and 7) and making the resection very difficult. In 20 cases the dislocation of the anterior inferior free border of the quadrilateral cartilage (so-called columnar cartilage) from its proper seat above the septum cutaneum, (septum anticum of Kretschmann, Fraenkel's Archiv. fuer Laryngologie, Vol. 14, page 562, 1903) referred to under bowed deflections, occurred. In these deviations the anterior plane of the vertical angle lies across both nares obliquely from behind forward, the anterior angle of the quadrilateral cartilage being displaced from its normal position between the median plates of the alar cartilages, and the inferior angle from its attachment to the crista incisiva, so that the dislocated anterior inferior free border of the cartilage of the septum is seen as a projecting ridge under the skin in the nostril of the concavity, beside the septum cutaneum (Fig. 8). Eight deviations were sigmoid horizontally, blocking both nares.

Thirteen perforations into the opposite naris occurred. Nine of them were minute; the largest of the size of a pea. Three were larger; of the size of a thumbnail. Six perforations were made in my first 15 cases; 3 were unavoidable as they were made in cicatrices due to previous operations. In the last 101 cases there were 5 perforations. None of them led to scabbing or caused their possessors discomfort.

Killian's Grouping of Deflections.—Killian divides deflections into two groups, one due to faulty growth of the septum and one due to traumatism. In describing the former group he says that the strongest convexity, as a rule, corresponds to the upper border of the vomer, but that the quadrilateral cartilage may be bent below or high up, (in what form is not stated) in the latter case the deviation usually involving the perpendicular plate. He states that crest formation is seldom absent in natural deviations and that these crests always follow the superior border of the vomer, ascending obliquely from below upwards. He finds marked deviations usually associated with the formation of a marked ledge or crest.

Traumatic deflections Killian describes as always occupying the anterior part of the septum, in the region of the cartilage, but he says that they may extend more or less extensively into the bone and that the type of deflections due to injury is acute angled, the fractured lamellae of the quadrangular cartilage forming a sharp angle whose planes approach each other from above and below, the groove of the concavity extending from

before backward. The anterior portion of the septum undergoes torsion about its vertical axis and closes the hollow of the concavity from in front, its free border projecting into the open nostril, its anterior surface presenting broadly in the obstructed one. Where the fractured lamellae are joined the cartilage is thickened and the fragments may overlap.

Portions of this description by Killian bring to my mind deflections as I have found them, but I fail to recognize what has seemed to me typical in a great part of it. I certainly have found nothing that suggested to me a division into a traumatic group and one due to faulty growth. I do not think that a deflection should be called traumatic simply because its shape indicates traumatic origin, even though this suggestive form be accompanied by the patient's history of an injury to the nose in the past, for blows upon the nose are so common that he is quite sure to recollect one to which his trouble might be attributed, even though his deflection be obviously not traumatic, as for instance a bony deviation far back.

The majority of my deviations had an acute vertical angle, usually far forward in the naris, that would have accorded with Killian's description of the traumatic deflection, yet in only a few of these did the patients date their trouble distinctly from a violent blow upon the nose, and in these there was usually a clear history of fracture of the nasal bones. Even in cases of fresh injury where a blow was severe enough to fracture or displace the nasal bones from their attachment, I have commonly merely found the cartilage of the septum carried over to the right or left, or gently curved, and I have not seen acute angled fractures of the cartilage shaped like an angular deflection even in these severer injuries. I have no doubt that they occur where the cartilage is unusually brittle, but as a rule it is so resilient that it springs back into its original shape. This is proven by the difficulty experienced in preventing the elasticity of the cartilage from reproducing deflections corrected by the fracturing operations. Acute angled deviations of the cartilage are extremely common, yet according to my experience their acute production from fracture is very rarely seen, though an injury sufficient to create such a fracture would certainly be severe enough to bring the patient to the surgeon for inspection.

Killian speaks of traumatic deviations that are continued into the bone. It does not seem mechanically reasonable that

force enough should be conveyed by the elastic cartilage of the septum to its bony skeleton to break either the perpendicular plate or the vomer. The fact, therefore, that a cartilaginous deflection is continued into the bone is to my mind an argument against its traumatic origin. I think, therefore, that while traumatic deviations occur their frequency is overestimated and that it is better to leave the supposed etiology of deflections out of the question in grouping and describing them.

The Influence of Age upon the Operation.—Children.—The ages of my patients as shown varied between the extremes of 50 and 8 years. The healing in my middle aged and oldest patients was as rapid as in younger ones. Killian advises against intranasal surgery in old persons except for urgent indications. Aged people have never demanded the operation of me, but I should perform it upon robust patients up to the age of 60.

Killian's statement, that as a general thing children younger than twelve are not fit subjects for the window resection, is not in accord with my experience, and I should operate on children at any age, though so far my youngest patient was eight years old. Dr. Herman Stolte of Milwaukee successfully resected the septum of a child of five. Erhard Mueller reports 3 successful operations upon children under 10, one of them 6 years old. Killian contends that the smallness of the field in children, the need of general narcosis and our inexperience as to the effects of further growth of the septum, are contraindications. I have not found my 6 operations on children difficult, as my slender instruments are perfectly adapted to a small operative field and the combination of cocain anesthesia with chloroform makes the slightest narcosis suffice.

To investigate the effects of growth upon the resected septum, I recalled for examination my first 3 child patients of the ages of 9, 8, and 9, at the time of operation and operated upon respectively 18, 10 and 7 months before the time for reinspection. All of these children had had unusually extensive osseocartilaginous deflections and in all of them the septum had become entirely firm at the site of the window and the cartilage and bone seemed to be replaced. The deflection in the first child was partly reproduced. The result in the other two remained perfect.

The first child had a double angled deflection of extreme

type causing obliteration of the right naris. The external bony and cartilaginous nose was curved in the form of a C towards the obstructed nostril and the whole septum was arched over into the occluded nasal fossa. A large window was made extending from the nasal vestibule far back into the bony septum. The anterior inferior free border of the quadrangular cartilage projected somewhat into the left naris but not enough to make its removal seem necessary. When the patient was re-examined after 18 months the cartilaginous part of the deflection was found to be one-half reproduced, the naris being one-half clear in front, instead of entirely free, as it was a few weeks after the operation. There was no reappearance of the bony obstruction.

The second child had required an extensive resection of a crest shaped deflection from the front of the nostril to nearly the posterior border of the vomer. The re-examination in this case in 10 months showed a straight septum and ideal results.

The third child had an extreme angular deflection with double angle obliterating the right naris. The bony deflection extended back to near the posterior border of the vomer. In this case the naris was also found perfectly free 8 months after operation.

The first case shows that growth in children tends to reproduce a deflection in part unless every vestige of it be removed, for I do not think that there would have been a return even in this extreme case if I had resected the dislocated anterior inferior portion of the quadrangular cartilage from the naris of the concavity, for it was this residue of the deviation that caused the front of the septum to continue to grow in a faulty direction.

My conclusion, therefore, is that the operation is proper for children at all ages, but that it does not suffice to merely resect enough cartilage and bone to establish free respiration if the septum is to grow in a vertical plane.

Permanency of Result.—To test the permanency of the result of the operation in adults I have sent letters to a number of my earlier patients and so far 10 have responded. The time elapsing between operation and examination was 2 years and 11 months in 2 cases, 2½ years in 5 cases and about 2 years and 2 months in 3 cases. In 5 of these patients the site of the window was firm, showing that probably the cartilage and bone were reproduced. In 4 cases, all of the window except

an area in the centre of the size of a bean to a dime was firm, showing that probably some cartilage had reformed from the edges of the window. I think that my more recent cases will show a larger percentage of entirely firm windows, as practice enables me to save the periosteum better than I did.

In one of the re-examined cases a perforation made by the operation existed. It had smooth borders, did not scab and caused the patient no inconvenience. The result was ideal in all of the cases re-inspected, nasal respiration was free, it was usually impossible to see that there had been an operation, and in no case was there any sinking in of the bridge of the nose, or formation of scabs.

Possibility of Damage to the Nasal Profile.—Some operators hesitate to adopt the window resection, urging that though it does not itself cause the bridge of the nose to sink in, its support is nevertheless weakened, so that a blow on the nose would readily flatten it. The effect of severe blows upon the nose has been tested in four of my cases. Two of them were boys, one aged 15 and the other 16. In the first case the deflection was confined to the cartilage, a large window being made, reaching from the nasal floor high up to the perpendicular plate. Seven days after the operation the patient was struck violently on the nose by a man's elbow, nose-bleed for fifteen minutes resulting. When seen two days later the nasal bridge was not depressed in the least and the septum remained straight.

In the second case the deflection was also cartilaginous with a sharp vertical angle, and extended from the front of the septum to its bony part. Twelve days after the operation the patient bumped his nose forcibly into another boy while running. Prolonged nose-bleed followed, but when he was examined 19 days after the operation, there was not only no deformity of the external nose, but the window was already filled with tissue as firm as cartilage.

The third patient came to me $2\frac{1}{2}$ years after the operation. He had received a blow on the nose a week before he came for re-examination. The nasal bones had been dislocated to the left, their connection with the frontal processes of the superior maxillary bone being broken. They had been replaced and the bridge of the nose was still swollen, but was not depressed in spite of this violent injury and the septum remained straight. In this case an angular, purely cartilaginous deflection, extend-

ing high up into the perpendicular plate, had been resected. The fourth patient received a blow from a man's hand on his nose 3 weeks after an extensive resection of an osseo-cartilaginous deflection reaching to the front of the septum and upward into the perpendicular plate. No damage beyond nose-bleed.

Mueller says that a slight saddle nose may result if a wide enough strip of the anterior highest part of the quadrangular cartilage be not retained, as this part supports the dorsum of the nose. Mueller especially warns against pulling or breaking away cartilage in this region, as several times when he did this distinct but not marked sinking in of the nasal bridge followed. Pulling or breaking out of fragments of cartilage has always been excluded from my method and there is no need of it, as my cartilage knives pare off the cartilage cleanly and exactly where it is desired.

Mueller has also, he thinks, seen slight retraction of the profile from cicatricial retraction of the septum as a post-operative sequel. This may be due to the fact that he sacrifices the mucosa of the convexity, after Krieg, and so creates a large cicatrizing surface.

Menzel says that "one is certain to obtain a saddle nose, a sinking in of the cartilaginous bridge, if one resects the cartilaginous septum too closely to it." He saw such deformities among his first cases, due, he thinks, to retraction of scar tissue forming between the two layers of the mucosa. Menzel advises the retention of the portion of the cartilage of the septum corresponding to the dorsum of the nose to the extent of a strip 1 to $1\frac{1}{2}$ centimeters in width. I agree with Mueller that in some deviations high up and far forward, the under surface of the lateral cartilage of the external nose must be approached more closely than this, in resecting, to sufficiently free the naris. Although I have never seen the least sinking in of the nasal bridge after the operation and Killian does not even mention it, I think that nevertheless Mueller's and Menzel's warning should be heeded and that, in deflections far forward, a buttress of cartilage, at least $\frac{1}{2}$ a centimeter deep (Fig. 9, b. b.) should be left behind the nasal bridge above the alar cartilages. In the great majority of cases it is needless to resect so closely to the nasal bridge that its support comes into question.

In contra-distinction to the part of the quadrangular carti-

lage immediately underneath the lateral cartilages just mentioned, all of the lower portion of the quadrangular cartilage, extending back horizontally behind its free border and anterior angle, up to the level of the top of the alae nasi, may be resected back to the bone without fear. (Fig. 9 aa.) The needlessness of this part of the cartilaginous septum is shown by the many cases where it naturally extends across both nostrils, curled up, dislocated from its attachments and obviously supporting nothing, the nasal profile of the individual nevertheless being faultless in spite of the many accidents to which noses are exposed. However I agree with Weil that only deflected cartilage should be sacrificed and that for this reason it is objectionable to begin the resection at the free border of the cartilage for all deviations, even for those beginning a distance behind it, as is done by Hajek and Menzel. I do not think with him, however, for the reasons stated, that the support of the external nose depends at all upon the lower portions of the cartilage outlined above. In a number of cases I have resected, when this portion of the cartilage was deflected, from the anterior angle and free border far back into the bony septum and the bridge of the nose has always stayed straight.

Incomplete Operations.—Some operators speak of the window resection as a simple little operation that may be done with a few ordinary instruments. In a series of resections some will always prove easy and a number of these among the first cases readily leads to the thought that they are all easy. In addition there is a tendency among some operators to resect only enough of the deflection to partly free the naris. Thus, they may remove only the cartilaginous part of the osseocartilaginous deviation, or only the prominent parts of the bone and cartilage. A half operation of this kind is of course usually easy, but it is sometimes a fatiguing and difficult matter, requiring special instruments to radically extirpate a deflection to its limits. This should always be done, however, for the cocain and adrenalin employed make the naris for the time abnormally clear, and when the shrinkage of the mucosa so created passes off, sufficient patency does not remain unless all of the deviation be gone. The result is satisfactory when the posterior wall of the nasopharynx and the motions of the levator palati muscle can be plainly seen through the naris which has contained the deflection.

Description of the Operation.—*Preparations.*—The operation is to be done according to the rules of aseptic surgery, a knowledge of which may be presupposed. Though it is desirable, as Killian does, to operate in a special aseptic operating room, most rhinologists have to do the work in their offices or in clinical rooms used for all cases. Though this has been my case, I have had no trouble from sepsis, except in 3 early cases, where there was transient suppuration of the wound which hardly delayed healing. There has been nothing of the sort in my last 12 operations. An important preparatory step is the clipping away of all vibrissae, so that the nasal vestibule may be well cleansed and the view of the operation be unobstructed.

Though the nasal fossae back of the vestibule, as Killian states, contain no virulent germs when healthy, and need no cleansing before an operation, the surgeon may be called upon to perform it in nares affected with acute or chronic rhinitis, secreting muco-pus and obviously superficially infected. Killian says that in these cases "if the submucous operation be nevertheless indicated, one may try to cleanse the nose and weaken the virulence of bacteria by irrigation with weak antiseptic solutions." This treatment would merely remove secretion from the surface and leave the tissues still infected, and in such cases I defer the operation until I have subdued the suppuration with daily irrigations followed by swabbing of the general mucous surface and meatuses with a 25 per cent solution of argyrol. This penetrating silver salt usually stops the infectious discharge and makes the operative field safer than if one resected at once. In sinus disease one may have to operate in spite of chronic suppuration.

Position of the Patient.—The sitting position for the patient seems to be the only one employed excepting by Leon E. White and myself. In my earlier operations I also used no other but since my 29th resection I usually, during the greater part of the resection, have the patient lie upon an operating table that can raise or lower his head to the required level. The patient lies upon his back while the operator stands at ease beside him, instead of bending over towards him in a strained position, as he does when both are sitting. When the patient reclines the assistants holding the retractors and swabbing can see better what they are doing, the patient is at rest, has none of the attacks of faintness at the beginning of the

operation that he is liable to when he sits up, and he does not suffer the discomfort of having to hold his head fixed in a rigid position. The flow of blood is usually so slight that it is all or nearly all swabbed away, the few drops that run back into the pharynx being swallowed by the patient or hawked up at intervals so far apart that the course of the operation is hardly disturbed. Operating in the cartilaginous septum and in the bone above the lowest parts along the nasal floor is made less difficult by the patient's recumbent position, but it is easier to resect a deflected crista incisiva or foremost part of the vomer when he is sitting. When he does so I employ a head-rest for him or have an attendant steady his head. Some full-blooded people in lying down have continuous oozing of blood from the wound and such persons should also sit in the chair.

Lights Employed.—I still regard the Kirstein electric head-lamp (Fig. 10) as the most suitable light. It makes the operator independent of a source of light for reflection, a great advantage, for such a light is in the way of assistants and as it can not be used when the patient is recumbent, the operation is interrupted, if he needs to lie down, because of faintness. The Kirstein light is preferable to the other electric headlamps as it is the only one which permits the operator to see deeply, as its rays are parallel to the axis of the surgeon's eye, which looks through the hole in the mirror. This is important in resecting bone far back in the naris where it is hardest to see and where a good illumination is needed. The objections to the Kirstein light are the frequent burning out of the expensive lamps, the frail connections, the need of a rheostat and the difficulty some have in adjusting the mirror to the eye. Those who prefer it may use a pigtail filament, 50 candlepower, stereopticon, Edison incandescent light (Fig. 11.) for reflection with the head mirror. This light gives an intense homogeneous field of illumination and may be adjusted so that it may be reflected from while patient is recumbent.

A number of operators have complained to me that the Kirstein light did not give sufficient illumination. This is due to the use of a rheostat which does not permit enough current to pass through it. The Kirstein light requires ordinarily from 10 to 12 volts and about an ampere, as it has a heavy filament. A rheostat which has a 50-candle power lamp in series on the 110-volt current will suffice. I use the O. C.

rheostat, a simple device which may be screwed into any wall socket.

Anesthesia.—Killian employs submucous injections of a $\frac{1}{2}$ per cent. solution of cocain with 4 drops of suprarenum hydrochloricum (a German adrenalin preparation, 1 to 1,000 in physiologic salt solution) to 2 cc of cocain solution. Preceding this injection he applies a 20 per cent cocain solution to its intended site on the anterior lower part of the septum. He tries to force the fluid through a long needle between the perichondrium and cartilage if possible. One cc is injected on each side of the septum and the anesthetic gradually spreads until large portions of the septum lose their sensibility. Killian waits 15 minutes for local insensibility and immediately before operation also applies a 20 per cent. cocain solution to the mucous surface.

White packs the convex naris for $\frac{1}{2}$ an hour with a pledget of cotton soaked in a 4 per cent cocain solution.

Menzel paints the mucosa of both sides of the septum with a 20 per cent solution of cocain and 1 to 1,000 adrenalin, then he uses Schleich's infiltration at the site of the incision and backwards between mucosa and cartilage on both sides.

In the exceptional cases where I resect from the free border of the cartilage, as I do where it is dislocated into the naris of the concavity, I inject submucously a 2 per cent solution on each side of it, for the thick epithelium over the foremost, lowest part of the septum hinders absorption from the surface. In all other cases, as formerly, I first swab adrenalin 1 to 1000 upon the sides of the septum, following it in about three minutes with pure powdered cocain, applied with a minute moist swab to the same regions. The concentration of the drug produces profound local insensibility, which is confined to the operative field and is so rapid that the first cut may be made in about five minutes after the application. Some who have watched me have contrasted the painlessness of my resections with the greater suffering caused by other operators and they attributed the perfect insensibility to the rubbing in of powdered cocain. I have never seen noteworthy cocain intoxication, though as the operation proceeds I repeatedly apply the pure drug to the wound surfaces to maintain the anesthesia and as a hemostatic. The entire amount of cocain absorbed is small and much of it is swabbed off again. I employ this method for all intranasal operations and except in the locality

mentioned I can see no reason for the troublesome submucous injections which, combined with additional swabbing with a 20 per cent. solution of cocain, certainly lead to the absorption of as much of the drug as my method does.

Weil suggests possible injury to the vitality of the flaps from Schleich's infiltration.

For children I combine chloroform narcosis with the application of cocain. Just enough chloroform is used to keep the child unconscious of its surroundings. As a rule hardly a half narcosis is maintained.

Assistance.—An attendant is needed to hold the nostril open with retractors and it is well to have one to swab the field of operation or hand swabs to the surgeon. At least sixty cotton swabs upon pointed applicators should be ready, to avoid the need of rolling new ones during the resection.

Specula.—Killian justly refers to the unfitness of the usual specula for the operation and has an attendant hold a single tracheotomy retractor to keep the naris open. I use my original flat retractors (Fig. 12, R. S.), one narrow and one broad, and find that a much better view is obtained with both of them than with a single retractor.

The Incisions in the Mucous Membrane.—Opinions all agree that it is best to resect from the convex side if possible.

For the usual deflection with a vertical angle, however slight, and a horizontal angle, I now make an incision of the shape of a capital L, looking backward, the vertical cut, as of old, following the angle of the vertical deflection and beginning high up on the septum above the deviation, the horizontal cut extending forward from the bottom of the vertical one along the crest of the horizontal deflection, if it be acute and projects greatly. If it be little pronounced, the incision is made along the nasal floor. The cut should extend to the very front of the septum in most cases. (Fig. 13.) This outlines an anterior flap with its base forward. The posterior extension of the horizontal cut, which gave the older incisions the form of an inverted T, I only use in bony deflections hard to reach. The reason for usually making the horizontal cut along the crest of acute angled horizontal deflections and not along their base is the frequently great adherence of the mucosa at the apex of the horizontal deflection and below it, so that its separation from below is difficult and it is better

to dissect it off downward from an incision made along the crest.

For crestlike deflections an incision is made from behind forward along the whole length of the crest of the deflection, curving the cut upwards at the front. This outlines a superior instead of an anterior flap. (Fig. 14.)

Many of the crest-shaped deflections begin far back in the naris and are nearly or entirely bony. In these cases I make my incision in the mucosa for entering the deflection in the manner of White, that is just in front of the deflection and not on its summit. A vertical cut is made extending from high up on the septum to its bottom so as to give the freest access to the operative field. If enough room be not obtained a horizontal incision along the bottom of the septum may be added later.

The mucous membrane cuts are made with the knives with half round-edged or round-edged blades (Fig. 12, D, C, B, E, I), C and B being used for vertical angles occurring far back and I along the base of the septum in front. The incisions should go through the perichondrium, so that it can be elevated from the subjacent cartilage. If the cut does not go down to the cartilage the dissection takes place between mucosa and perichondrium, a difficult process, only possible with keen blades. Where the deflection extends across both nostrils and the anterior inferior free border of the septum is displaced into the naris of the concavity enough to obstruct breathing, I begin the resection by an incision from the free border of the septum on the concave side and from this dissect out as much of the deflection as can be reached in this way. If it extends far back into the bone I then make my usual vertical cut along the vertical angle on the side of the convexity and dissect from this. (Fig. 15.) The general principle of my incisions, in short, is to follow the summit of the angle or angles of deviation wherever they may be except in the deep-seated crest-like deflections mentioned.

In distinction to my method all other authors describe their mucous membrane incision as made at the front of the septum and in front of the deviation instead of over it. Thus Killian makes one cut about one-half centimeter behind the border of the septum mobile (*cutaneum*), but not parallel to it, for it ascends from behind and below upward and forward. White's cut is made vertically, just anterior to the deflection

from above its top to the nasal floor. Hajek and Menzel make a single cut beside the septum mobile directly upon the free border of the quadrangle cartilage, their incision being curved backward at each end. Krieg, Mueller and Boenninghaus make three incisions, one upon the free border of the cartilage, a second extending parallel to the back of the nose backward, and a third along the floor of the nose. The Krieg type of incision gives good access to the deflection, but leaves a loose flap badly shaped for preservation, and which it is the intention of Krieg and his followers to cut off at the end of the operation.

As the Killian, Menzel, Hajek and White incision is made in the foremost part of the septum, the remotest and most difficult part of the deflection behind must be reached from a point on the septum at the greatest distance in front of it. Their cuts give ready access to the anterior part of the deviation but sacrifice present gain for future difficulty, for it makes the portions of the deflection far back less accessible, and so encourages imperfect removal of the bony part of deflections.

With the incision at the front of the septum the operator resects under a long sac of mucous membrane on the convex side of ever increasing depth, so that it becomes more and more awkward to keep the detached mucosa out of the way, and for this reason Killian has added as a complication to the operation the use of his long speculum for rhinoscopia media (Fig. 16), to spread open the mucous coverings on both sides of the septum. Even a short speculum I have always found much in the way of sight and the free use of instruments, especially cutting forceps, where the deeper parts are to be operated upon, and I do not wonder that Killian does not think the operation suited to little children if he blocks their little nostrils with his speculum.

Another objection to the mucous membrane incision far in front is the fact that it coincides with the first cut through the cartilage, so that if a perforation be made here it penetrates both coverings of the septum at once and hence remains permanent, while my anterior flap in this region overlies an accidental perforation through the mucosa of the concavity and closes it. The foremost part of the septum is the worst place for a perforation, as it crusts for a long time.

Mueller, in speaking of Hajek's and Menzel's incision, and

this applies as well to Killian's and White's, says: "How often does one meet with massive deep-seated obstructions, angular bends, bony prominences and spines in complicated noses, after free space has been made in the anterior half of the naris? To obtain a perfect result it is absolutely necessary to remove such obstacles. To reach them from a button-hole incision, seated in front in the region of the septum mobile, is very difficult, tedious and often absolutely impossible. In such cases one is forced, if one expects to succeed with Hajek's method, to be satisfied with a less perfect freeing of the nasal passages than those obtain who operate by Krieg's method."

Zarniko says: "I have discarded the simple straight cut of Menzel with short, curved continuations at the ends, as the view into the depths of the mucous membrane pocket did not suffice."

My incisions give as much access to the deeper parts and as much freedom for operation as Krieg's, and, nevertheless, the mucosa of the convexity is preserved.

My mucous membrane pocket begins not far in front, but at the vertical angle or summit of deflection, so that the separation of this posterior part of the mucosa of the convexity is easy and the short sac created by its elevation stays open, no long speculum being needed, the separated mucosa clinging with its epithelial surface to the turbinals, or, at the most, needing to be held off with a slender spatula. The greatest advantage of my incisions, therefore, is the creation of flaps that make the deepest bony parts of the deflection readily accessible. This is true of the reversed L, inverted T and single cut along the horizontal angle. The readiest access to a deflection is obtained by a cut along its summit.

The Instruments for the Separation of the Mucous Membrane.—The principles of this part of the operation do not seem to be clearly conceived by all, to judge from the number of unnecessarily large and massive instruments devised. The heavy bone implements of the general surgeon seem to have served as models for some of them. The problem is not so much to scrape off the perichondrium and periosteum from the septum as one would denude the tibia, as to undermine carefully the coverings of the deflection, for the instruments, on account of the position of the septum between two narrow cavities, must of necessity work nearly parallel to the surface attacked, especially on the concave side, so that scraping is

only possible to a limited extent in front. In addition, the soft, yielding, springy cartilage is not as suitable as bone for scraping with chisel-like instruments.

The undermining must be done in narrowest places, around corners and often at a great depth in the naris, by actual measurement in many of my cases two to three inches behind the front of the external nostril. The type of elevator demanded is, therefore, thin edged and flat, so that it may undermine readily; narrow, so that it may fit small nares; long and gently curved, so that it may work around corners and keep its edge always close to the surface to be denuded, lest it perforate the mucosa. Sharp and dull separators are needed, the dull one being merely without keen edge, but never blunt, as blunt instruments perforate readily by punching through in front of adherent places. The sharp elevator, and in addition my round-edged knives of various forms (Fig. 12, L. E. D. I.), are used for keen dissection in places where the covering of the septum is adherent. In the large majority of cases all of the separation may be done with the dulled separator, but the crests of deflection, the bottom of the concavity, cicatrices after previous operative attempts, quite often both sides of the crista incisiva and vomer below the horizontal angle of deflection, and occasionally the foremost part of the cartilage, are places where the covering may need to be dissected away in places instead of separating readily throughout.

The type of elevators used by Hajek and Spratt do not conform to the requirements mentioned. Spratt's are veritable chisels. Hajek has a blunt and a sharp elevator. (Fig. 17.) Both are clubbed at the end, straight, five-sixteenths of an inch wide and one-eighth inch thick. Such large instruments hide the view in narrow nares, and would be quite unfit for the minute nostrils of children. In the eleven cases of obliteration of the nostril encountered they could hardly have been wedged between the deflection and the inferior turbinated body, not to speak of conducting the elevation of the mucosa in such a narrow fissure. The sharp elevator has a thick edge, rounded on one side, and flat on the other, and is more like a raspatory than a dissector. A blunt round-edged separator, like Hajek's, is apt to plunge through the often frail perichondrium, periosteum and mucosa of the concavity if even moderate force be used in front of slightly adherent places, where a thin-edged dull

separator will undermine the covering, a fact that made me abandon blunt separators long ago. Hajek's elevators are made for an operation of strength rather than of delicacy. White's separators (Fig. 18) have a better form, but are straight and designed only for roomy noses. He speaks of "freeing the cartilage from its mucosa in a short time with these powerful instruments." He mentions no instrument for sharp dissection.

The most important instrumentarium recently brought to notice is that of Killian. His separators are thinner and better fitted for the work than those mentioned. For blunt separation he has a straight one (Fig. 19 A), and one curved (Fig. 19 B) at the end on the flat, both about $\frac{1}{4}$ of an inch wide and though I regard these instruments as too large for operating in children's noses I think they would fit the average case.

The bayonet-shaped sharp elevators (Fig. 20 A) are designed to start the separation of the mucosa from Killian's incision in the front of the nostril. The other sharp elevator, "old model," is also described as used merely to begin the resection in front. It is long and straight and could be used deep in the nares, but its edge, as well as that of the bayonet-shaped separators, is thick, flat on one side and so rounded on the other that it could only be used for scraping and not for cutting, a type of edge I abandoned with the use of Ingals' spud. Killian has no keen-bladed instrument for sharp dissection with its front end (tip), as his little knife (Fig. 21) cuts only from its side, while even my half-round bladed knife (Fig. 12 D), has its edge carried over its back, and the round-bladed knife (Fig. 12 E), and sharp elevator (Fig. 12 L), may be also used for this purpose. Cutting with the front end of the knife is needed in dissecting out the anterior inferior portion of the cartilage from its free border and in liberating adherent places in the hollow of the concavity.

An objection to Killian's and White's instruments is the use of an angular attachment of the handle to the shank, the so-called nasal angle, designed to keep the hand below the level of the nose under the supposition that it gets in the way of sight when holding a straight instrument. Mine are all made straight, yet I can always see the field of operation perfectly. Even slight pressure against the distal end of an angu-

lar instrument tends to rotate the handle, which therefore has to be held firmly, either in the fingers, or, as is easiest, grasped in the whole hand. This effort implies a stiff wrist and fingers, and makes it necessary to make the motions of the instrument with the coarse muscles of the arm and shoulder instead of the finer ones of the hand and fingers, which are capable of more accurate and controlled work. Straight instruments can be held lightly and easily while at work, as their motion is direct and the muscles that move them are those of the hand and fingers. The presence of an angle also complicates the movements needed and disturbs the sense of direction.

The Separation of the Mucosa on the Convex Side.—In order to reach the deepest parts of the nares my spatulae or elevators (Fig. 12, L, M) have been lengthened since their last description.

The mucous membrane and perichondrium of the septum, as I have found them, form two distinct layers. The perichondrium is thin and transparent and is readily overlooked because the whiteness of the cartilage shines through it, and the inexperienced operator, therefore, not seeing it, imagines that he has a surface of bare cartilage before him, and so, instead of lifting the perichondrium from the cartilage, a task of easy performance, is apt to attempt to liberate the mucosa from the perichondrium, a feat impossible for dull instruments and difficult for sharp ones. Killian emphasizes this point well. It is therefore necessary to search for the beginning of this thin film of perichondrium at the edges of the incisions, gently scraping it up with the dulled separator until the instrument will pass underneath it, when the mucosa may usually be readily lifted off with it. Nevertheless there are places where the perichondrium or periosteum clings to cartilage or bone, and here the dulled instrument is laid aside for a moment and a sharp dissector used until the elevation with the dulled spatula may be resumed.

In the double-angled deflections the anterior flap should be reflected in this way, a little beyond the limits of the deflection, so that it will fold back and stay out of the way.

The pocket of mucous membrane behind the vertical angle is made next by undermining perichondrium and periosteum over the entire area of the deflection, backward, and, if possible, downward to the base of the septum. The separation

upwards and backwards is usually very easy, but along the crest of and below the horizontal angle of deflection, keen dissection with the sharp spatula is often required and the elevation of the mucosa may be so difficult that it may even have to be deferred until removal of the cartilage makes the bony deviation more accessible.

In the crest-like deflections an upper flap is made following the incisions described. It should be large enough to fold upward as much out of the way as possible. The separation is then continued below the horizontal crest, a mucous membrane pocket being created which reaches the base of the septum, the crista incisiva and vomer being thus bared below the horizontal angle. (Fig. 14.) As stated, sharp dissection is often needed in this region.

In the deep-seated crest-like deflections described the separation is readily conducted from the vertical incision recommended, for in these cases there is no anterior deviation to respect first.

In the anterior deflections that require dissection from the free border of the quadrangular cartilage in the naris of the concavity, keen dissection with the round-bladed knife (Fig. 12 E) is sometimes needed for a distance back of about one-half to three-quarters of an inch before dull separation becomes possible.

In the usual double-angled type of deviation even when the deflection has a very acute, prominent vertical angle pressing into the inferior turbinal, there is no trouble in lifting off the mucosa back of it with my thin curved spatula, which follows around the angle from the vertical incision along its summit. Killian says that "the sharp-angled, traumatic deviations of the cartilago quadrangularis create especial difficulty and that whoever attempts to separate the mucosa around these corners will perforate, as a rule." This is true of his operation from an incision in front of the deflection, but the difficulty is obviated by my vertical cut along the vertical angle.

The First Cut Through the Cartilage.—Killian makes his first cut through the cartilage with his sharp-edged elevator, "scratching the cartilage in the direction of the mucous membrane cut and trying slowly to work through it." The instrument is applied in nearly a sagittal direction, while the little

finger guards the mucosa in the other nostril. Mueller also scratches through the cartilage. Zarniko uses a gouge. As Menzel dissects from the free border, he does not need to cut through the cartilage.

A clean cut through the cartilage with my thin-bladed, razor-edged knife (Fig. 12 D) is less apt to perforate the mucous membrane of the concavity than tedious scratching through with a thick-edged, sharp instrument, for the keen knife cuts with slight strokes and is held lightly, like a pen, in relaxed fingers, while it is necessary to hold the thick-bladed instrument more firmly and to make pressure on the septum with it in order to make it cut, hence it is liable to suddenly plunge through the mucosa of the concavity when the cartilage is pierced. The light stroke used in cutting with a thin blade permits a delicate sense of touch which tells the operator when he has penetrated the cartilage. For this reason I have abandoned the use of the little finger in the other nostril to feel for the edge of the knife under the mucosa, for this divides the attention. When the knife seems to have severed the cartilage along a line of about one-half an inch the cut edge is felt for with a dull spatula, lifted up, and seized with delicate, rat-toothed forceps (Fig. 22), which pull upon it, while the penetrating cut is finished with the severed edge of cartilage in plain view as a guide. I always operate with the right hand, no matter in which nostril the deflection is, and I do not agree with Killian that "he who wishes to always operate upon the convex side, that is, at one time in the left and again in the right nostril, must be able to use the knife and elevatorium with the left as well as with the right hand."

Before making the first cartilaginous incision in the common double-angled deflections the anterior flap is held out of the way with the retractor, which holds the nostril open, or with a fine double tenaculum. The first cut through the cartilage is then made as formerly, along the entire base of the reflected anterior flap. (Fig. 23.) In the region below the level of the anterior angle of the quadrangular cartilage, that is, below the upper boundary of the alae nasi, the incision may be made at the very front of the cartilage, if the deflection extend so far in front. Above this boundary, where the quadrangular cartilage underlies the lateral cartilages of the external nose, the incision should leave a distance of at least

one-half a centimeter, about a quarter of an inch, between it and the under surface of the nasal bridge, in order to furnish the support for the external nose demanded by Mueller and Menzel.

In making the first cut the blade is not held at a right angle to the surface, but is slightly inclined away from the operator. This makes an oblique cut into which the spatula is readily inserted for lifting up the cartilage. I no longer conduct the whole of the elevation of the mucosa of the concave side through a single anterior incision in the cartilage, but merely free a small strip of the cartilage back of the incision, working the spatula downward on the concave side until I reach the base of the septum. The Ingals' cartilage knife is then introduced into the small space created under the cartilage, its point is turned away from the mucosa of the concavity and a small horizontal incision is made through the cartilage along its base towards the front. This produces a small angular cartilaginous flap, which gives more room for freeing the mucosa of the concavity than the single cut does. (Fig. 23 AA.)

The rarer crest-like deflections usually begin deeper in the naris than those with double angle. The first incision in the cartilage in these is made vertically in the plane septum, just in front of the beginning of the deflection. (Fig. 14 E.) This plan is adhered to even where the deflection is wholly osseous, the cartilage being undermined until the bone is reached. If desired, a small anterior flap can be made to cover the site of the first cut.

The Separation of the Mucosa on the Concave Side.—The separation of the mucosa of the concavity may be watched from the nostril of the convexity or of the concavity of the deflection. In the latter case the motions of the instruments may be plainly seen under the covering of the septum. The little angular cartilage flap just described gives such a free approach to the parts underneath the cartilage that I now almost always look into the naris of the convexity while conducting the separation of the opposite mucosa, only occasionally glancing into the other to see that no perforation has occurred and that the hollow of the concavity is becoming effaced.

As Killian states, the elevation of the mucosa of the concavity, if strictly superichondrial, is usually easy and it may cavity, if strictly subperichondrial, is usually easy and it may

generally be conducted with the dulled separator. But he also speaks of adhesions in deep grooves and depressions. In my experience not infrequently a rapidly progressing, manifestly subperichondrial elevation is unexpectedly checked by an area of firm cohesion between the perichondrium and periosteum and the cartilage or bone, so that a dull separator would punch through, progress becoming impossible except by dissection with the sharp spatula. The separation is also apt to be tedious where the concavity forms a very deep hollow whose curved walls are hard to follow with the separators.

Where Killian encounters adherent areas he advises waiting to release them until a good-sized piece of cartilage is resected to give access to them. This is a good method where the area of adhesion is large or inaccessible. Usually I finish the separation in one act, dissecting off the adherent places. While the elevation of the mucosa of the concavity progresses the rat-toothed forceps pull aside the freed portion of cartilage. In separating the perichondrium the curve of the spatula should look towards the cartilage in order to keep the end of the instrument upon its surface. The most difficult separation is usually found below the deepest pit or trough of the concavity, on the side of the vomer or crista, and the separation of the periosteum from here may have to be deferred until the resection of the cartilage gives better access.

The separation of the concave side is not finished until the mucous membrane hangs away from the hollow of the deflection and the septum looks straight in the nostril of the concavity.

The Resection of the Cartilage.—Before cutting away the cartilage the operator must be sure that it is entirely bared of its coverings on both sides, lest a piece of mucosa be torn out with it when it is removed.

Since my earliest operations, as described in my first paper (*The Correction of Deflections of the Nasal Septum, with a Minimum of Traumatism, Journal of the A. M. A.,* March 8, 1902), in March, 1902, I have usually succeeded in removing all, or the greater part of the cartilaginous deflection in one piece. I have never had to change the method of doing this.

The bared cartilage is pulled outward with the rat-toothed forceps while Ingals' cartilage knife (Fig. 12 H) is introduced underneath it to the back of the pocket of mucosa on the concave side of the deflection. Its point is directed towards

the convex side and its back towards the mucosa of the concavity. It is then made to prick through the cartilage at the bottom and hindmost part of the cartilaginous deflection, and its blade is then drawn forward, cutting through the bottom of the cartilage along its whole length, from the concave towards the convex side, and severing the cartilaginous deflection below. To cut through it at the back an angular cartilage knife is chosen whose edge looks downward when its point is directed away from the concavity. This knife is also passed to the bottom of the mucous membrane pocket of the concavity underneath the cartilage (Fig. 24), its point turned away from the concavity, made to prick through the cartilage at the highest point in the rear of the cartilaginous deflection, and the blade is then made to sweep downward, severing the cartilage at the back. The other of the pair of angular cartilage knives is now inserted into the slit made by the first one, the handle depressed and the blade made to sweep forward, cutting through the cartilage above. The piece being now severed at all of its boundaries is readily drawn out of the nostril.

I regard the exsection of the cartilaginous deflection as one of the simplest acts of the whole performance. If the cartilage be thick, repeated strokes of the knives instead of one will finally cut through it, but for very thick cartilage I have an extra pair of longer angular blades (Fig. 12, F, G.) They are very seldom needed and a convenience rather than a necessity. The whole manuever is done with the aid of vision and under the intelligent guidance of the hand, so that one can exactly outline the piece to be removed. Remaining vestiges of the cartilaginous deflection may be pared off strip by strip with the angular knives, the sharp separator or Ingals' knife, and I rarely now use cutting forceps on the cartilage.

In distinction to this method Killian uses a forked cartilage knife (Fig. 25), with a little blade between the tines of the fork, designed to cut horizontally from in front. This knife is pushed backward, the cartilage entering the space between the tines of the fork as the knife advances into it. In this manner a cut is made at the bottom and top of the deflection. The piece between these incisions is then "removed with dressing forceps ("Kornzange")." It is to be inferred from this that its posterior attachment is torn away. This is not exact surgery, for the tough cartilage is apt to tear through

in an unwished for place, so that one may remove too little or too much, and so tear out unseparated mucosa behind. I quote Killian literally: "Das Instrument wird in der Weise verwandt, dass man das zu resezierende Knorpelstueck zuerst oben, dann unten in der Richtung von vorn nach hinten durchscheidet und dann das zwischenliegende Stueck mit der Kornzange entfernt." Killian says that the distance between the tines of his fork "corresponds to the thickness of the cartilage of the septum." This distance, as I have measured it, is three-thirty-seconds of an inch. In sixteen of my cases the cartilage was either uniformly or in places one-eighth to five-sixteenths of an inch thick, and in these it could not have been made to enter a fork whose tines were three-thirty-seconds of an inch apart, so that the advance of the knife in these cases would have been impossible.

W. L. Ballenger has greatly improved Killian's knife by making the blade moveable on a swivel joint, so that no matter what the position of the fork the edge of the knife is always in advance. (Fig. 26.) In this way he can cut above and behind and thus remove a piece in one process.

Ballenger's knife, though it has the tines of the fork three-sixteenths of an inch apart, has a blade no wider than Killian's, about three-thirty-seconds of an inch, and it would therefore also be useless where the septum is thicker than this. If the blade be made wider the tines of the fork must also be further apart, and Ballenger did not find this practical. His fork necessarily projects beyond the seat of the knife, so that an excess of separation of the mucosa is needed behind to make room for this in cutting upward, and a strip of bared cartilage, therefore, remains attached posteriorly. In an instance that has come to the author's knowledge the cartilage was so thick that it pried the advancing fork open, causing the blade to drop out, showing that cartilage may be encountered that is too thick for even Ballenger's broad fork. Barring these objections, Ballenger's knife is undoubtedly serviceable, but I can see no need of a substitute for my simple knives, whose fixed blades are more accurately guided than a swinging swivel blade between the tines of a fork. Besides, my knives can cut any thickness of cartilage encountered.

White and Menzel remove the cartilage piecemeal with cutting forceps. Mueller cuts above and below with scissors

and breaks out the pieces with dressing forceps. The first method is needlessly tedious and the second rough surgery.

The Resection of Bony Deflections.—The Instrumentarium.—The punch forceps, according to my experience, removes bony deflections with more accuracy and less pain than any other instrument. A forceps designed for the resection of the bone should be slender, so as not to obstruct the view and to move freely in the cavity of the naris; the part in front of the lock should be straight and at least three and one-half inches (nine centimeters) long, for bone may have to be cut at a distance of two and one-half to three inches from the front of the nostril and a little length to spare is needed. The jaws should hinge on a rivet at the end of the forceps, so that they will separate widely in a small space and so that the opening of the instrument will not obstruct the view, as it does when the jaws are moved on the rivet of the lock of the forceps. The forceps should be of the "punch" variety, one jaw fitting within the other instead of merely having its cutting edge applied to that of its fellow, as this latter type of instrument will not cut bone, unless it be made so heavy that it blocks the nostril. In spite of the qualities of length and slenderness, the instrument should be so strong that it will easily cut through the thickest and hardest bone found in the septum.

The Gruenwald forceps, which I have used for years, possesses these qualities to perfection, except the last. For bone was occasionally met with which this forceps, strong as it is, could not cut through, or only after the jaws were repeatedly closed upon it. I have therefore strengthened Gruenwald's forceps by giving it a forceps handle instead of a scissors handle, and by other changes, so that I now have an instrument that will cut through the heaviest bone in the septum, even the crista and anterior end of the vomer with a moderate pressure of the hand. The slenderness and length of the forceps has been preserved and the jaws open laterally instead of vertically, as in the original, adapting the instrument still better for the septum. The blades are made only partly fenestrated, a ledge remaining designed to preserve the strength of the blade and to retain the exsected pieces and keep them from falling out in the nose. My modified forcep (Fraenkel's *Archiv fuer Laryngologie*, Vol. 17, page 172), like Gruenwald's, is made in three sizes. (Fig. 27.) The operator needs the

middle and smallest sizes. The large one is an occasional convenience.

Killian employs Hartmann's punch forceps. (Fig. 28.) This does not nearly equal Gruenwald's in strength, for its rivet is too weak and the distance from it to the end of the blades is too long. It is too light to be reliable for cutting bone and would break easily.

The Jansen-Middleton forceps (Fig. 29), has been lately recommended for the operation. It is powerful, yet, on account of its spoon-shaped blades, whose edges merely meet instead of fitting into each other, it cannot make a clean cut in bone. Hajek (Fig. 30) has adapted the punch and die system to this same forceps and his modification does cut bone. Both patterns of forceps, however, are only fairly slender for one and one-half inches back of the cutting end, behind this the broad, square sockets of the joints make them too large to enter the nostril, hence they cannot be employed deep in the naris.

White states that the distance from the lock to the ends of the cutting blades of his forceps (Fig. 31), which is of the Hartmann rongeur pattern, and is not a punch but a spoon-bladed one, is seven centimeters, but not more than five centimeters of this length is available, because of the strong curve of the blades, whose massiveness unfits them for work in a narrow cavity.

In addition to punch forceps, a chisel or gouge (Fig. 12 N, O, P) is required for the removal of the deflected crista and anterior end of the vomer.

Killian employs a strong bayonet-shaped gouge, the distance from the cutting end to the bayonet angle being one and one-quarter inches, so that the instrument could only be used an inch back of the anterior nasal spine. (Fig. 32.)

The saw is not suited to the operation and most authors do not mention it.

Scissors only cut to advantage horizontally in the nose and the bone of the septum is too strong for them in most places.

I have employed the dental motor and trephine but three times in my last 67 operations. I restrict it to cases where there is need of removal of the anterior plane of a thick vertical deflection far back in the vomer (Figs. 6 and 7). Such obstructions lie across the naris like a wall and are hard to grasp with forceps. The trephine I use is unguarded, one

and three-quarter inches long and its diameter is three and one-sixteenth inches.

The Removal of the Bone.—The bony part of the operation receives such slight mention from most authors and the means described for its performance are so inadequate that the inference is natural that it is frequently not thoroughly done. Yet it is often the most difficult act of the resection and unless all vestiges of the bony deviation be removed a half result is likely to occur for which the surgeon will always feel apologetic.

In most bony deflections, in looking directly backward in the naris of the convexity, after completion of the resection of the cartilage, one sees the steep superior border of the vomer joined above, at an angle caused by the deflection, by the anterior inferior border of the perpendicular plate or, more often, by a remnant of cartilage which is the posterior angle of the quadrangular cartilage. The angle of deflection mentioned is the horizontal angle in vertical section and appears like a V lying upon its side (Fig. 33), and it is this V and the parts back of it that are to be resected posteriorly. Looking *downward* at the floor of the nose the continuation of the superior border of the vomer forward and the crista are seen, freed of cartilage, the vomer and crista curling over towards the naris of the convexity, sometimes so strongly that they lie nearly flat on the nasal floor, making the surface belonging to the concave side look upward and simulate the bottom of the naris.

The bony resection begins with the extirpation of the posterior V mentioned. The operator should assure himself beforehand that the bone is completely freed from its covering on both sides. It is easy to avoid injuring the liberated mucosa and no long speculum is needed in my operation to hold the mucous sacks open; at the most the spatula is required to lift away the mucosa of the convexity; that of the concavity hangs away. The forceps is now introduced, its jaws slipped as far onto the bone as possible, piece after piece bitten out and the V followed upward and backward until completely removed, even if it extends to the posterior end of the vomer. Where in an extreme deflection the V crowds firmly against the inferior turbinate it is sometimes difficult to wedge into the fissure so created even the blade of the forceps, not to speak of using a speculum blade in addition. I do not

see how Killian can cut bony deflections of this nature between the blades of his long speculum. In these very difficult deflections one cannot always save all of the posterior part of the mucosa of the convexity. The operator should not let the wish to preserve it or the fear of a possible perforation keep him away from a thorough resection of the bone, for the loss of some of the mucosa or the occurrence of a perforation far back in the naris is of little consequence, while an imperfect result is a great disappointment.

After the resection of the V posteriorly the curved-over maxillary crest and front of the vomer, on the nasal floor, next need removal. They should be reinspected to see whether they are denuded of their covering, for the separation of the mucosa over these bony parts has very often to be put off until the last, because of the difficulty of its removal. It is commonly firmly adherent, because, as Killian states, the front end of the vomer and the crista are enveloped in their own periosteum, which therefore covers their upper border after the cartilage has been resected from it. This periosteum is continuous with and has the same color as the perichondrium lining the inner surface of the mucosa of the concavity, so that no boundary is visible where this is reflected onto the bone and the edge of the bone can, therefore, not be seen, but must be felt for and cut down on with the round-edged knife. The bone is then dissected out from its coverings by keen dissection, with the sharp spatula and the knife A (Fig. 12), which is designed to release it on the concave side. The periosteum in this region is usually too adherent to be scraped away.

When the anterior end of the vomer and the crista stand bare, they may be cut away with my forceps if they project enough to be seized with it. If not, the chisel is applied in front and driven back as far as the bone is deviated, with light taps of a small mallet. Killian then advises to lift the chisel and to break off the severed strip behind. This is an excellent method. It is also proper in this locality, and this only, to twist off with dressing forceps the posterior attachment of the fragment partly detached with the chisel, for no harm can come from doing this so near the nasal floor.

The chisel is only suited to the strong, well supported base of the vomer and crista, and should not be used higher up on the septum, as it is liable to shiver the frail and brittle bone

in these regions and create far-reaching fissures.

Breaking out of pieces of bone by twisting with forceps is also to be avoided, except in the one place mentioned, for the same reasons. It causes great pain and the result of the violence may be fracture in distant places.

When the resection seems complete an attempt should be made to smooth down the flaps on the septum. If remnants of the deviation exist above or below, the mucous membrane will not lie down and the projecting bone or cartilage must be trimmed off until it does.

The concave side should also be inspected to see whether the hollow be effaced.

Killian directs the operator to cut away the thin part of the vomer and lamina perpendicularis with the Hartmann forceps above the crest and then, with the same instrument, to resect the vomer below it, behind the part cut away with the gouge. The crest of the deflection he then breaks out with forceps, after it is thus freed above and below. I agree with Killian that the bone above the crest is usually thin, but am not in accord with his statement that "the vomer below a deviation and crest is always very thin." On the contrary, I have found the vomer below the horizontal crest of deflection so often strong and massive that I regard thickness and not thinness of this part as typical. (Fig. 34.) I do not think the weak Hartmann forceps could have cut the bone I encountered in many cases. To break out the strong angle of the bony deviation from its often frail and brittle setting behind, after it has been freed above and below, as Killian does, is inexact surgery, would be very painful and might lead to fractures in the lamina perpendicularis reaching far beyond the intended break.

Mueller outlines a tongue of cartilage and bone above and below with scissors and with dressing forceps twists out the deviation in one piece or several fragments; a primitive and painful method that includes the danger mentioned.

Suturing.—Killian says that, as a rule, he no longer sews and he only recommends sutures if a perforation through both layers of the mucosa in the same place has occurred.

White has a special pair of alligator needle holders and sews his flap with them in about ten minutes.

Krieg and Mueller, of course, do not sew, as they remove the mucosa of the convexity.

Zarniko has ceased to sew and Weil depends on the tampon, as I do, to retain the flap in place.

I regard sutures as unnecessary. White and Menzel are, therefore, the only ones who make suturing a regular step of the operation, and I think that in time it will disappear from it, except for the purpose indicated by Killian. For sewing, in the deeper parts of the naris, Killian employs a needle (Fig. 35 A), bent at an acute angle on the end of a long stem, attached to a handle. The threaded needle is passed through both edges of the wound in the mucosa, from before backward, the edges being steadied with forceps. The thread is then caught with a minute hook (Fig. 35 B), and the needle pulled out, leaving the thread in place. It is then tied with the aid of dressing forceps.

The Tamponade.—Mueller and Zarniko permit the patient to go home without packing the nostril; all of the other authors use a tampon.

I have always packed the naris in all my cases and, nevertheless, twice, merely because I tamponed too loosely, I have had severe delayed hemorrhage occur about two hours after the operation. I regard it as dangerous to dismiss a patient unless the naris be evenly plugged on the operated side, and on both, if there has been a perforation.

Killian always plugs both sides. I regard this as a needless discomfort to the patient.

I still use sterilized lint, impregnated with subnitrate of bismuth, for my tampon, and in no case (even when the plug has been in the nose a week) has it ever become offensive. Bismuth is far superior to iodoform as an antiseptic in these cases.

I no longer pack with one long strip, but introduce the lint in successive layers. It is cut in ribbons one-quarter on an inch wide and eight to ten inches long. Before packing the nose the flaps are smoothed down into place with a small swab, and readily adhere. I have long discarded the use of a metal guard to protect the wound while packing, as it prevents the even filling of the naris and leaves the tampon loose when the guard is withdrawn.

To begin the packing a strip is folded in its middle, the ends being held between the thumb and index finger of the left hand, while the right pushes the end of a stiff nasal probe, such as Gruenwald's, against the bottom of the fold, to hold

the strip taut. (Fig. 36.) It may also be stretched by the thumb and fingers of the same hand that holds the probe. The strip, stretched in this manner, is passed in along the nasal floor to a little beyond the posterior end of the window. It is then pressed down on the nasal floor with the probe. If the resection of a crest-like deflection has left an inferior flap or pocket of mucosa, it is to be supported by the strip. In the same manner successive strips are then introduced (Fig. 37), one above the other, until the nose is nearly full, the ends of those in the naris being held against the upper lip with the ring finger of the left hand, while the next strip is passed in. As the tampon builds up it sustains the flaps so that they cannot become displaced. They are not always redundant enough to meet exactly at their edges, but a small raw surface left by their retraction is of no moment. The last strip is longer than the others, and is tucked in on top in successive little folds, as was done in my older method of packing, completing the filling of the naris.

This packing may be relied upon to prevent hemorrhage, but an hour or two after the operation, no matter how completely the naris be stuffed, a watery, free, mucous discharge, tinged with blood, usually sets in and is caused by the relaxation of the vessels constricted by adrenalin and cocain. If the patient be not warned of this discharge he is apt to think that his nose is bleeding and in his alarm to needlessly disturb the surgeon.

The removal of the packing is begun on the second day after the operation by withdrawing the top strip and as much of the others as will pull out easily and without bleeding. When all hold fast or when a few drops of blood appear, the removal of the rest is deferred until the next day. In the average case the tampon is out by the third or fourth day. The parallel situation of the strips prevents excessive bulging of the mucosa over the window into the naris of the concavity.

The patient needs to stay in bed only on the day of the operation. After that he may be up and about, but should not go to work for a week.

The after treatment is simple. For the first ten days the naris is kept closed with a pledget of cotton, to exclude dust and keep the secretions moist. After this the patient may use the naris for respiration, is told to spray it out with normal salt solution and insert a little plug of wet cotton in the nos-

tril for a few hours whenever needed to soften dried secretion. In addition an ointment of salicylic acid, ten grains to six drams of lanolin and two drams of vaselin is swabbed into the nasal vestibule by the patient to prevent hardened mucus from adhering. After four to six weeks the nose needs no further treatment.

During the first two to three weeks after the operation the soft parts of the septum are somewhat swollen, so that the patient has not the free breathing he obtains later, nasal respiration continuously improving until after six weeks the naris becomes ideally clear.

A review of the literature of the subject of the window resection has shown me that each author has created his own methods, with little heed for what others have done, so that to the novice the already large list of ways of doing the operation must be bewildering. Comparison of methods and custom will in time evolve an operation of classic uniformity and it is to be presumed that the best will survive.

Suckstorff, in his brief history of the window-resection, says that "through Killian's modification, the sub-mucous resection has been elevated to a height that should satisfy all reasonable demands." Neither Killian's views, instrumentarium or methods seem to me so faultless that they deserve this praise. His statement that he does the operation in the average time of twenty minutes sounds rather like quick than careful surgery. I quote literally from Killian's article: "Zur Vornahme der ganzen Operation brauche ich im Durchschnitt 20 Minuten." The minimum time that I need for a purely cartilaginous deflection is twenty minutes, but the average time for my operations is at least three-quarters of an hour to an hour, for in the 60 per cent. of my cases more or less difficult bony deflections needed removal. An average time of twenty minutes for me would mean that my purely cartilaginous deviations were resected in about five minutes, or else that I did not extirpate the bony deviations completely. It may be urged that Killian is a rapid operator, and that his method saves time. As to the method, if I had to resect the numerous massive, deep-seated, prolonged bony deviations that I have met, by means of a buttonhole incision in front, a long speculum to obstruct the entrance of the naris, the weak Hartmann forceps, Killian's short gouge and a dressing forceps, I should take much longer than I do now. Granting that Killian is

the speediest of operators, he can not so far outstrip all others that he can do in an average of twenty minutes what other operators of great experience admit has the one fault of a tedious operation. The depth and narrowness of the field in the bony operation, the strained vision needed to see to slip the blades of the forceps over the edge of the bone, the difficulty of wedging a blade between marked deviations and the inferior turbinate, the need of frequent wiping, as a drop of blood obscures the remote, contracted field, these are all factors that make the bony operation necessarily prolonged if it is to be well done by any operator.

Conclusions.—1. The appearance of deflections does not divide them naturally into two great groups with distinct aspect, one obviously traumatic and the other due to faulty growth, as is taught by Killian. To consider etiology in this way in the description of deflections is merely confusing and it is better, as heretofore, to group them according to their shape.

2. The window resection is adapted to children, but the chance of a possible recurrence from the effects of growth demands a very complete removal of the vestiges of the deflection.

3. The firmness, and, therefore, probably the cartilage and bone of the septum, is completely or nearly completely reproduced in the window after the resection.

4. Cases seen two and one-half years after the operation show permanency of the result.

5. Though the author has never seen a case of sinking in of the nasal bridge after the window resection, Mueller's and Menzel's warning should be heeded to retain a strip of the cartilage of the septum under the lateral cartilages of the external nose.

6. The lower portion of the quadrangular cartilage, as high as the level of the alae nasi, may be resected without fear, from its anterior inferior free border horizontally back to the bone.

7. The recumbent position of the patient is the best for the operation, except in operating along the nasal floor.

8. The Kirstein light is the most suitable one.

9. The use of powdered cocain, applied with a swab, gives a perfect and safe local anesthesia and the submucous injec-

tion of cocain is needless, except at the very front of the septum.

10. The best access to a deflection for its resection is obtained by mucous membrane incisions along its vertical and horizontal crests, and not by means of a buttonhole cut in front of it, such as is made by Killian and others.

11. The separators used for the elevation of the mucosa should be thin, curved, and either dulled or knife-edged for dissection.

12. The presence of a nasal angle in an instrument complicates its movements, and makes it necessary to hold it with a stiff wrist and fingers, thus sacrificing the lightness and accuracy of motion of straight instruments.

13. It is better to make the first cut through the cartilage with a keen, thin, round-bladed knife than with a thicker sharp-edge that scratches through.

14. Even if strictly subperichondrial, the elevation of the mucosa is apt to encounter adherent places that need separation by keen dissection.

15. The cutting out of the denuded cartilage in one piece is the easiest part of my operation.

16. With the exception of fragments, cut with the chisel from the crista incisiva or anterior end of the vomer, neither cartilage nor bone should ever be broken, twisted or torn from its attachment, but should always be cleanly cut away.

17. The author's modification of Gruenwald's punch forceps has proven the best instrument he has used for resecting the bone, as it is slender and long, and yet easily cuts through the thickest bone encountered.

18. There is a tendency to hasty and incomplete removal of the bony part of the deflection.

19. Sewing is needless.

20. Strips of lint, impregnated with subnitrate of bismuth, make the best tampon. The author introduces the strips in layers, as described, so that the flaps are perfectly held in place.

21. Considering the many difficult bony resections met with, the author does not think that the operation can be well done in the average time of twenty minutes, the estimated time of Killian.

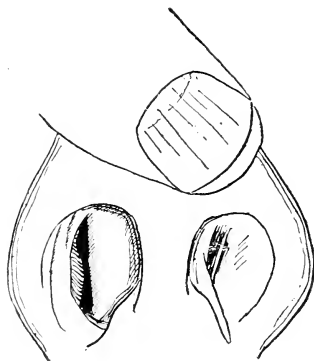


Fig. 1. Deflection showing vertical angle. From life.

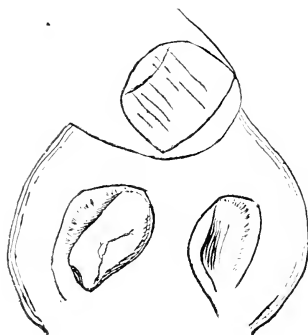


Fig. 2. Deflection showing vertical angle. From life.

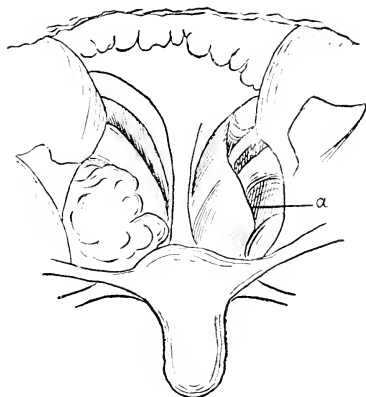


Fig. 3. Posterior view of a bony deflection. From life. a, deflection.

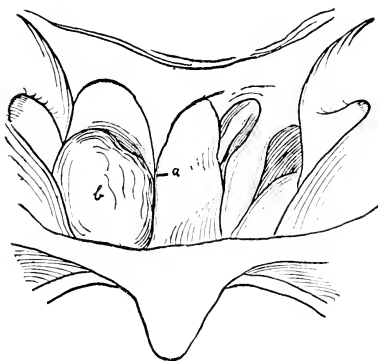


Fig. 4. View of a deflection of the posterior end of the vomer. a, deflection. b, intumescent inferior turbinate. From life.

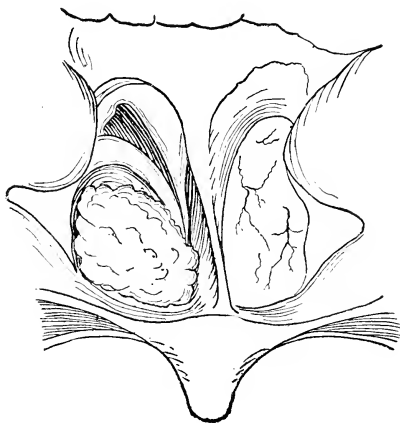
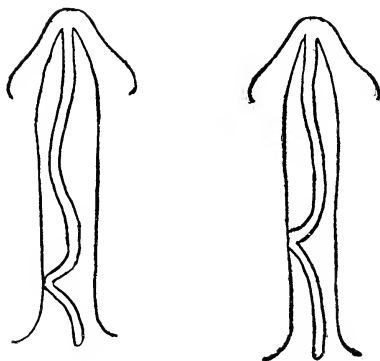


Fig. 5. View of a deflection of the posterior end of the vomer. Congenital atresia of the left choana. From life.



Figs. 6 and 7. Horizontal section of septum showing sharp vertical deflection of vomer.

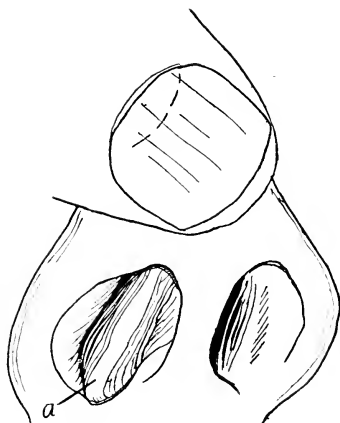


Fig. 8. Greatly thickened anterior inferior free border of the quadrangular cartilage lying beside the septum cutaneum. a, cartilage. From life.

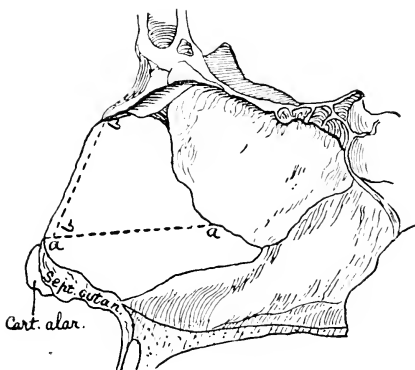


Fig. 9. The nasal septum. aa, line below which the cartilage may be completely removed. bb, posterior limit of strip of cartilage under nasal bridge to be preserved.

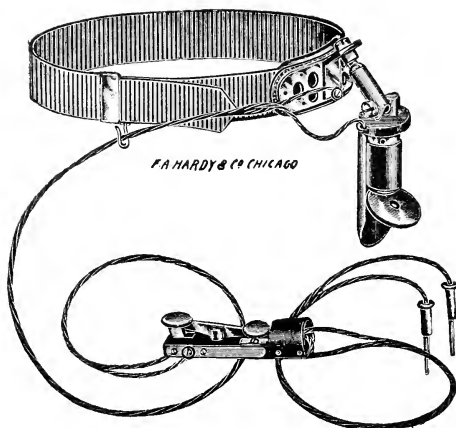


Fig. 10. Kirstein headlamp.

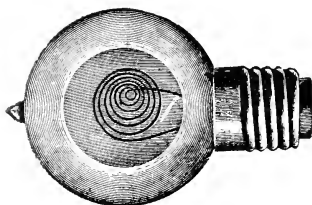


Fig. 11. Edison stereopticon electric light.

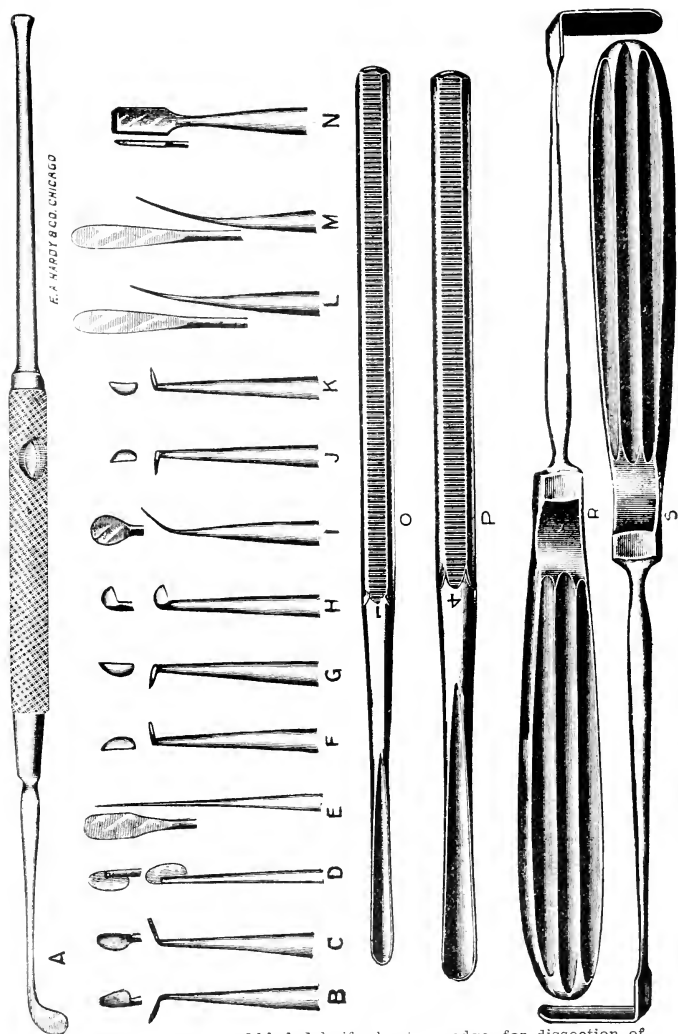


Fig. 12. A, round-bladed knife, bent on edge, for dissection of mucous membrane from concave side of bony base of deflection. B and C, half-round-bladed angular knives for vertical incision in mucous membrane when deflection is far back; D, half-round-bladed straight knife for vertical incision in mucous membrane when the deflection is nearer the front and for first cut in the cartilage; E, flat, round-bladed dissecting knife; I, angular, round-bladed knife; F, G, J and K, sharp-pointed, angular cartilage knives for cutting through back and upper part of cartilaginous deflection; H, Ingals' submucous cartilage knife; M, dull-edged elevator for uplifting of mucosa; L, sharp-edged elevator for dissecting up mucosa in adherent places; N, chisel; O, P, gouges; R, S, retractors for holding nostril open.

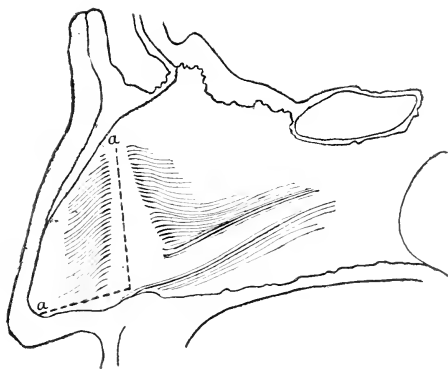


Fig. 13. Lateral view of convexity of double-angled deflection. a a, outline of mucous membrane incision.

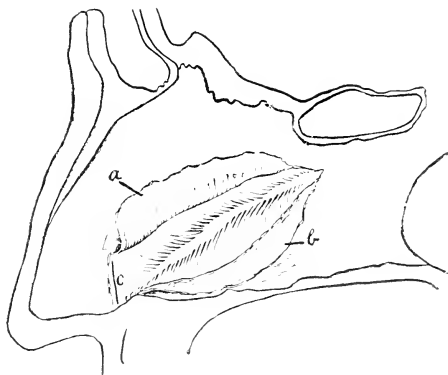


Fig. 14. Lateral view of convexity of crest-shaped deflection. a, superior flap; b, mucous membrane pouch formed below; c, first cut through cartilage in front of deflection.

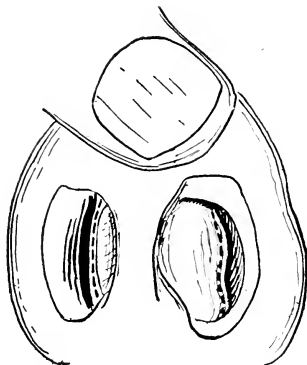


Fig. 15. Deflection showing vertical angle in left naris and dislocation of free border of cartilage into naris of concavity. Dotted line shows site of mucous membrane incisions.



Fig. 16. Killian's long specula for rhinoscopia media.

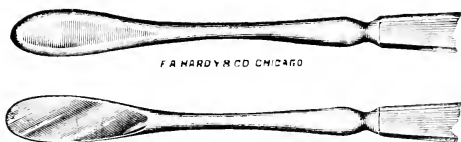


Fig. 17. Hajek's elevators; blunt and sharp. Natural size.

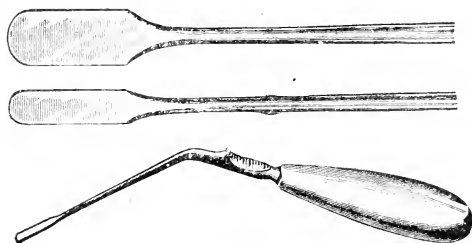


Fig. 18. White's separators.

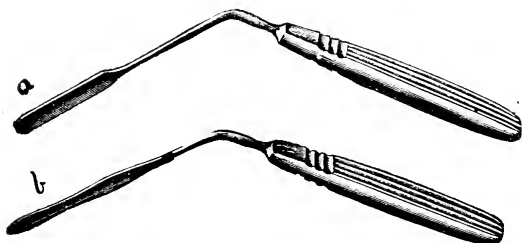


Fig. 19. Killian's blunt elevators. a, straight; b, curved.

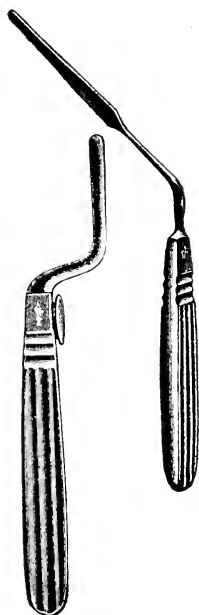


Fig. 20. One of Killian's right and left bayonet shaped, sharp elevators; old model sharp elevator.

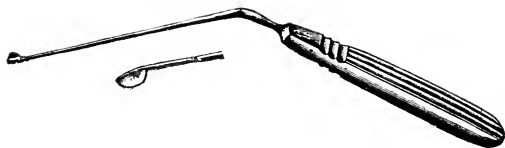


Fig. 21. Killian's septum knife.

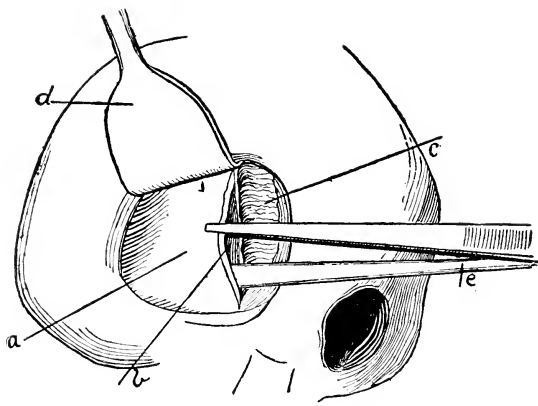


Fig. 22. Denuded deflection in the right naris seen somewhat from the side. The posterior edge of the slit in the cartilage is held with the rat-toothed forceps after it has been lifted up with the elevator. a, cartilaginous deflection; b, inner surface of the mucosa of the concavity; c, anterior flap; d, retractor lifting the wing of the nose; e, elevator underneath the cartilage.

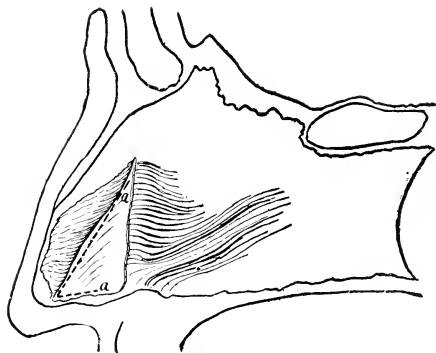


Fig. 23. Lateral view of the septum; a a, first incisions in cartilage outlining a, tongue-like flap.

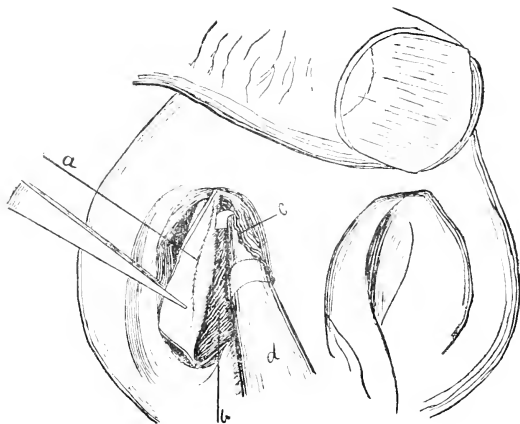


Fig. 24. The cartilaginous deflection, including the vertical angle a, has been cut through at its base and in front and is being severed behind and above by the angular cartilage knives; b, inner surface of the mucosa of the concavity of the deflection; c, anterior flap folded out of the way; d, angular cartilage knife.



Fig. 26. Ballenger's swivel cartilage knife.



Fig. 25. Killian's forked cartilage knife.

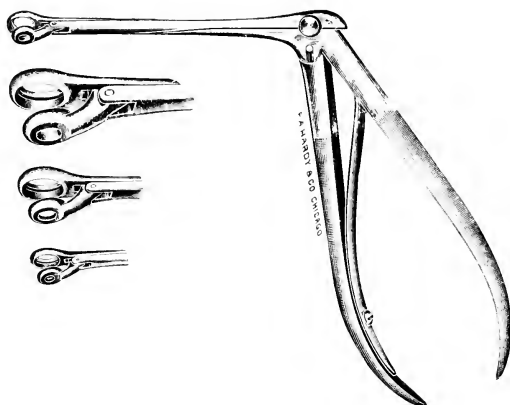


Fig. 27. Freer's modified Gruenwald forceps.

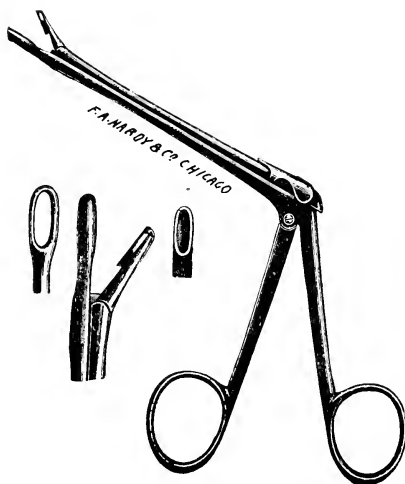


Fig. 28. Hartmann's punch forceps.



Fig. 29. Jansen-Middleton forceps.



Fig. 30. Hajek's modification of the Jansen-Middleton forceps.

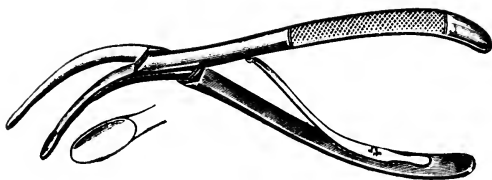


Fig. 31. White's forceps.



Fig. 32. Killian's gouge.

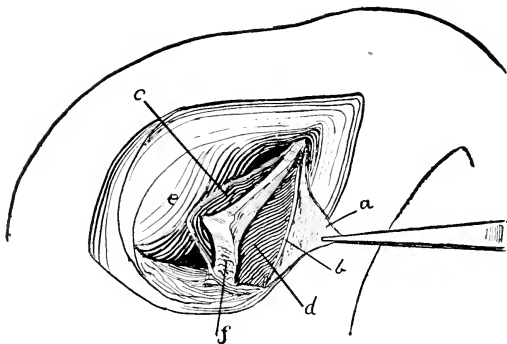


Fig. 33. V-shaped profile of bony deflection seen after removal of cartilaginous deviation; a, anterior flap; b, anterior cut edge of cartilage; c, separated mucosa of convexity of deflection; d, inner surface of mucosa of concavity of deflection; e, inferior turbinate; f, vomer.

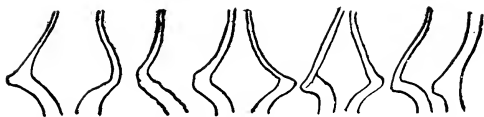


Fig. 34. Vertical profile of some of the bony deflections encountered showing thick vomer.

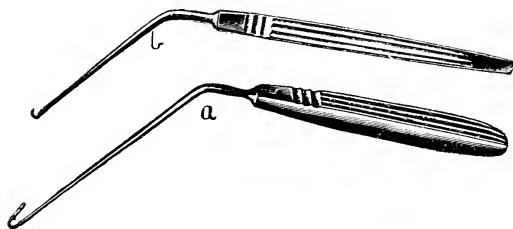


Fig. 35. Killian's needle, a, b, fine hook to catch thread.

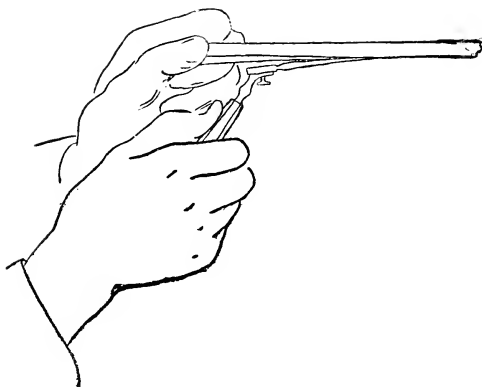


Fig. 36. Strip of bismuth lint pulled taut against end of probe for introduction.

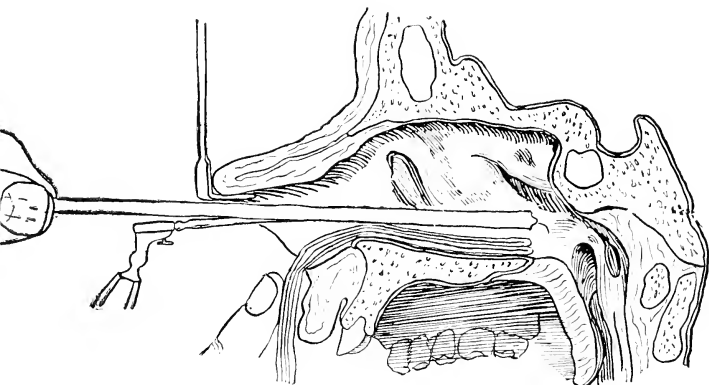


Fig. 37. Lateral view of nasal fossa. Two folded strips of the tampon lie in the naris, the loose ends being held with the finger against the upper lip. A third strip is being introduced stretched against the end of a probe.

XV.

THE NOSE AND ITS ACCESSORY SINUSES IN THE AMERICAN BEAR.

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A study of the nose and its accessory sinuses in different animals shows that these structures are comparatively simple ones in macrosmatic animals (animals which do not have an acute sense of smell), but in microsmatic animals (animals which have an acute sense of smell), the nose and its sinuses are highly specialized and developed. A good example of this remarkable development is found in the nasal organ of the American bear.

The bear's nose is a very complicated organ of respiration and olfaction, and may be considered as a fair type of the nose in carnivorous animals. These animals in their wild state obtain their food, for the most part, by being able to find it through their acute sense of smell and frequently it is necessary for them to pursue their prey, so that both the respiratory and olfactory functions of the nose play an important part in the maintenance of their existence and hence are especially well developed.

The anterior half of the bear's nose is used almost exclusively for respiratory purposes; the posterior half is divided into a respiratory portion and an olfactory portion. The septum is a thin plate of bone and cartilage situated in the median line, as in man. From each side of the vomer, a thin shelf-like plate of bone (Plates I and II, Figure 1) extends laterally across each fossa, subdividing the posterior part of each fossa into two superimposed cavities. The superior cavity is the larger one of the two, contains almost all of the ethmoidal turbinals (Plates I and II, Figures 2, 3, 4, 5 and 6) and forms

the greater part of the olfactory portion of the nose. The inferior cavity (Plates I, II and III, Figure 7) is a round, tube-like structure leading directly backward from the maxillary turbinal to the naso-pharynx (Plate I, Figures 8 and 9) and is used simply for respiratory purposes. The maxillary turbinal is a very complicated structure situated in the anterior part of the nose (Plates I and IV, Figure 8). It springs from a broad base attached to the superior maxillary bone. From this base, numerous branching processes are given off which form an intricate labyrinth, almost completely filling the anterior third of each nasal fossa.

The ethmoidal turbinals are exceedingly complex structures. There are five in each fossa, which radiate from the convex surface of the cribriform plate of the ethmoidal bone (Plates I and II, Figures 2, 3, 4, 5, and 6). Each ethmoidal turbinal consists of a mass of delicate wavy plates subdividing into almost innumerable branches which intertwine with each other and form a dense labyrinth. This labyrinth is lined throughout by a mucous membrane in which the numerous branches of the olfactory nerves are distributed and thus a tremendous expanse of olfactory mucous membrane is contained within a comparatively small space. The distribution of the olfactory nerves over such a large area makes the bear's sense of smell correspondingly acute. *Some of the numerous branches of the ethmoidal turbinals extend into each of the accessory cavities of the nose, and so in the bear's nose, the accessory sinuses all contain some olfactory turbinal structures and are a part of the olfactory portion of the nose.*

The superior ethmoidal turbinal (which corresponds to the middle turbinal in man) is the largest of the ethmoidal turbinals, and one of its processes, extending anteriorly, overlaps the maxillary turbinal throughout its entire length. All of the ethmoidal cells are formed by some of the numerous branches of this turbinal uniting with each other or with the surrounding bones of the skull (Plates I, II, III, and IV, Figure 11). There are five well developed ethmoidal cells, in each lateral half of the skull, all of which contain some branches of the ethmoidal turbinal.

The maxillary sinus is hollowed out of the superior maxillary bone (Plates III and IV, Figure 12). It begins just behind the posterior end of the maxillary turbinal and increases in size as it extends backward. The ostium maxillare

is a large irregularly oval opening extending downward almost to the floor of the cavity, which is considerably above the floor of the nose (Plate I, Figure 13). This sinus has practically no roof, for one large ethmoidal cell opens directly into it, being only partially separated from it by a lateral process of the superior ethmoidal turbinal (Plate III, Figure 6).

The hiatus semilunaris (Plate III, Figure 14), is a well defined groove in the ethmoidal turbinal leading directly from the frontal and ethmoidal cells into the maxillary sinus, so that these cells all drain into the maxillary sinus and thence directly into the nose, for the ostium of this sinus extends down to its floor.

There are two frontal sinuses in each lateral half of the skull (Plates I and II, Figure 15), separated from each other in the median line by a thin bony septum. The ostia of the frontal sinuses are in the inferior part of each of the cavities and small processes of the superior ethmoidal turbinal extend through them into the sinuses.

There is one sphenoidal sinus in each half of the skull (Plate I, Figure 16). The partition between them is somewhat irregular but it is situated about in the median line. From the posterior superior part of each sinus, a diverticulum extends laterally into the lesser wing of the sphenoidal bone. The ostium sphenoidalis is large and through it one of the ethmoidal turbinals projects directly into the cavity (Plate I, Figure 2).

Considering the bear's nose as a whole, it is an exceedingly highly developed organ. The turbinals are all very complex structures and the ethmoidal or olfactory turbinals are especially well developed.

The accessory sinuses are comparatively large and all contain ethmoidal turbinal tissue. They form a series of cavities extending over the external surface of the ethmoidal turbinals, and some of the cavities in each lateral half of the skull communicate with each other, but not with those of the opposite half of the skull. Their function seems to be to provide space for the tremendous development of the ethmoidal turbinals, to conduct air over the external surface of these structures and to furnish a system of drainage for them.

Comparing the nose and its accessory sinuses in man, with similar structures in the bear, we find that in man the turbinals have all degenerated (or reverted) into comparatively

simple structures. The number of the ethmoidal turbinals has decreased from five to two, but rudiments of the third, fourth and fifth ethmoidal turbinals are frequently seen in the embryo and sometimes in the adult. The relative position of the turbinals has changed owing to the tremendous development of the fore-brain and the consequent change in position of the bones in the anterior part of the skull. The relation of the cranium to the nasal cavity has also changed, for the cranium, in man, has enlarged so that it is situated

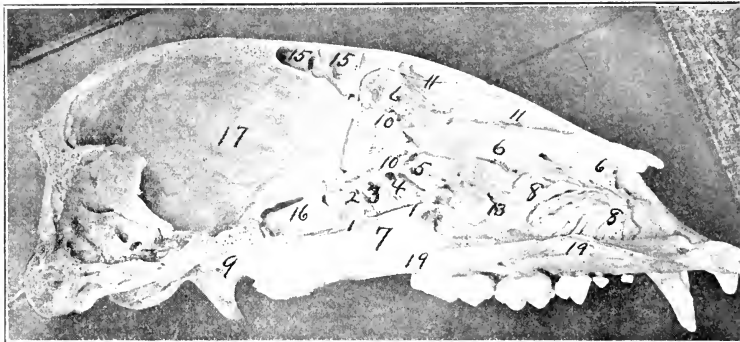


PLATE I.

Longitudinal section through a bear's skull, showing the left nasal fossa.

- 1—Lateral wing of vomer.
- 2, 3, 4, 5 and 6 designate the five ethmoidal turbinals, situated in the olfactory portion of the nose.
- 7—Part of the respiratory portion of the nose, separated from the olfactory portion by the lateral wing of the vomer.
- 8—Maxillary turbinal.
- 9—Nasopharynx.
- 10—Cribriform plate of the ethmoidal bone.
- 11—Ethmoidal cells.
- 13—Ostium maxillare, partially covered by the ethmoidal turbinal.
- 15—Frontal sinuses.
- 16—Sphenoidal sinus.
- 17—Brain cavity.
- 19—Palate.

directly over the nose instead of being posterior to the nose, as it is in the bear.

The accessory sinuses, in man, no longer contain any of the ethmoidal turbinal tructures, but rudiments of these structures are occasionally found in some of the sinuses. The sinuses themselves, are almost completely shut off from the nose by the contraction of their ostia and their functional activity is lost. Therefore, the accessory sinuses of the nose in man, seem to be simply rudimentary structures.



PLATE II.

Transverse section through the posterior part of the right half of a bear's nose, looking posteriorly.

- 1—Lateral wing of vomer.
- 4, 5, 6—Ethmoidal turbinals.
- 7—Posterior part of the respiratory portion of the nose.
- 11—Ethmoidal cells.
- 15—Frontal sinuses.
- 17—Brain cavity.
- 18—Orbit.
- 19—Palate.

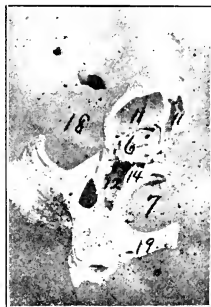


PLATE III.

Transverse section through the median portion of the right half of a bear's nose, looking posteriorly.

6—A portion of the ethmoidal turbinal forming an incomplete partition between one large ethmoidal cell (11) and the maxillary sinus (12). Just posterior to this lateral process of the ethmoidal turbinal, these two sinuses unite and form one large cavity.

7—Respiratory portion of the nose.

11—Ethmoidal cells.

12—Maxillary sinus.

14—Hiatus semilunaris.

18—Orbit.

19—Palate.



PLATE IV.

Transverse section through the right half of a bear's nose, just posterior to the maxillary turbinal, looking anteriorly.

- 6—Ethmoidal turbinal.
- 8—Maxillary turbinal.
- 11—Ethmoidal cells.
- 12—Maxillary sinus.
- 19—Palate.

XVI.

STRICTURE OF THE EUSTACHIAN TUBE IN AURAL DISEASES, AND ITS TREATMENT.*

BY W. SOHIER BRYANT, M. D.,

NEW YORK.

Stricture of the Eustachian tube is a reduction of the normal lumen of the tube, causing more or less obstruction. It may be organic or purely functional. When the stricture is tight it cannot be overlooked; when the obstruction is slight, the deviation from the normal tube is not apparent without careful tests. Though the presence of tubal obstruction is of very great importance, its full significance, unfortunately, is rarely appreciated.

The slightest obstruction causes the following evil results only in a less degree than a tight stricture:

I. Imperfect ventilation of the tympanum, causing either too little or too great barometric pressure in this wonderful chamber. The many baneful consequences resulting are (1) passive congestion, (2) over extension, or over flexion of the membrane, ossicular chain, and stapedio-fenestral articulation, any one of which destroys the acoustic balance, (3) irritation of the sensory and sympathetic nerve endings, (4) changes in nutrition, and (5) indirect effects on the labyrinth.

II. Imperfect drainage of the tympanum. Septic infection and absorption of septic material result; also clogging and over distention of the sound conducting apparatus from internal exudations.

III. Reflex congestion and edema of the mucosa and contents of the tympanum.

IV. Other reflex disturbances, often elusive, but nevertheless very important. An example of such disturbances is a

*Read before the Eastern Section of the American Laryngological, Rhinological and Otological Society, at Philadelphia, February 4th, 1905.

considerable loss of hearing released by the flow of air through the tube, where a total destruction of the drum membrane has occurred.

Strictures can be classified as acute and chronic; suppurative and non-suppurative. In this paper, I shall consider only the chronic non-suppurative group, which includes the larger majority of obstinate cases of impaired hearing and tinnitus, particularly those found in the omnibus of chronic middle ear catarrh.

Pathology.—A series of many hundred post-mortem examinations, which I made at the Harvard Medical School during the ten years between 1887 and 1897, failed to show a single case of organic stricture of the Eustachian tube, except in those of the suppurative class. In such cases, the stricture never occurred near the isthmus, but at the extremities of the tube. I therefore conclude that organic strictures of the isthmus are very rare; that organic strictures seldom if ever occur in any part of the Eustachian tube in non-suppurative conditions, and that the large number of strictures seen in practice are purely functional.

The pathology of the variety of stricture under consideration is passive congestion or edema. This is sometimes combined with slight paresis of the tubal muscles and with adhesions. An examination of the patients shows in most cases the presence of more than one of these conditions. Occasionally tenacious mucus will be found occluding the tube. Attempts at inflation, with osculation, will locate the stricture in the most vascular part of the tube, namely, the cartilaginous portion. This part also has the largest amount of areolar tissue. The nature of the sound given as the air passes does not suggest an annular, but a tubular narrowing more or less extensive.

Etiology.—There are two varieties of these strictures, (1) circulatory, due (a) to the faulty composition of the blood, and (b) to faulty circulation; (2) mechanical, due to impaired muscular action brought about (a) from some defect in the muscles, and (b) from mechanical interference with their action. In most cases, these conditions are combined in varying proportions. The predisposing causes of functional strictures are gout, syphilis, faulty general circulation, cardiac or arterial; hypertrophy and new growth in or about the naso-pharynx, adhesions and cicatrices of naso-pharynx, usually in

the fossa of Rosenmueller; mouth breathing, and rhino-pharyngitis.

The *Diagnosis* of organic stricture is made by a series of tests of permeability, by the use of compressed air. When no air can be forced through the Eustachian tube, bougies can be used, but on account of the many normal obstructions to the passage of a bougie, for instance the folds of mucous membrane of the pharyngeal part of the tube, the abnormal lateral narrowing of the osseous tube, and the occasional presence of bone spiculæ at the tympanic mouth of the tube,—the results must be interpreted with considerable caution. Whether a catheter with high air pressure would not show permeability in some of the cases where the finest bougie could not be passed into the tympanum is a question to be determined. I think it must be decided in the affirmative. It is well known that some cases, impermeable to the bougie, allow a flow of air without any great difficulty. Where the permeability of the tube is interfered with, the diagnosis of functional stricture should be accepted until the presence of organic stricture is demonstrated.

Test of permeability.—The nares must be clear enough to allow a flow of air, and the naso-pharynx must not be obstructed with thick mucus. While the patient is inflating the ear by Valsalva's method, the effect on the membrana tympani must be observed through the speculum. The readiness with which the air passes into the drum, and the ease of its reflux must also be noted. Normally, air should enter the tympanum on very slight intra-nasal pressure, and the excess of distention should disappear spontaneously when the intra-nasal pressure is exhausted. Any retardation in the inflation or reflux shows a stricture of the Eustachian tube. Its tightness is proportionate to the retardation of influx and reflux. Great care must be taken that the patient's head is not bent toward the ear under examination, for a certain amount of obstruction to the flow of air is normally caused by the compression due to flexion of the neck.

If the result of Valsalva's method of inflation is 0, then Politzer's method is tried, and if necessary, the catheter. Before air can be made to enter the tympanum, it may be necessary in some cases to increase the pressure through the catheter to 50 pounds. It is not wise to use more force. The degree of pressure required to overcome the stricture is a direct index

of its firmness and narrowness. The nearness or distance of the auscultatory sounds indicates the position of the stricture. The higher pitched the sound, the tighter the stricture. The smoother the sound, the smoother and clearer the walls of the stricture.

Both before and after attempts at inflation, the membrana tympani must always be inspected; much may be learned from its changed appearance. Only in this way can the presence of impeded reflux be known, because the resistance offered to the entrance of air is often no indication of the resistance offered to its exit. When air enters with difficulty, but escapes readily, the inference is that the stricture acts like a valve. Air sometimes passes into the tympanum in such small volume that it gives no auscultatory sound, its flow being indicated only by the evident signs of tympanic distention.

TREATMENT.

Since 1881 the treatment of these cases has received my special attention. Very many of them were treated successfully without the employment of any method of inflation.

In 1888, Dr. Spear called my attention to the intimate connection of the lower turbinate with the function of hearing. Since that time the examination and treatment of a large number of cases in Boston and New York has shown me that this auditory region of the nose extends backwards to the fossa of Rosenmueller and surrounds the Eustachian tube.

To emphasize a method of treatment which I have found successful in all the cases that have come under my care during the last two years, I will consider more particularly the treatment of functional stricture in which the constitutional disturbances are not great, and the naso-pharyngeal conditions are not sufficient to attract the cupidity of the rhinologist.

The treatment that I most rely upon at present is the application of adrenalin and solution of silver nitrate to the auditory regions of the nose and naso-pharynx. The cases treated in this way have shown, without exception, marked improvement in the calibre of their Eustachian tubes. Except once, in the case of an old lady, where too profuse an application of nitrate of silver solution caused a laryngeal irritation lasting a few hours, I have never had an acute inflammation excited, or any accident result from the treatment.

There are many well recognized methods of treatment which are serviceable under various conditions. *Constitutional treatment* requires attention to gout, syphilis, faulty cardiac and arterial circulation. *Nasal treatment* requires surgical removal of impediments to free nasal respiration. *Pharyngeal treatment* requires surgical removal of new growths or extensive hypertrophies, and the breaking down of adhesions. *Local treatment* may be given by bougies, electric and medicated; by Politzer's method of inflation and the catheter, with or without vapors; by injections into the tube, and by massage, and applications of reagents to the mouth of the tube and its neighborhood. The best of these reagents is nitrate of silver.

PROGNOSIS.

I find that, in the very large class of cases under consideration, the Eustachian tube has invariably responded to a persistent course of treatment and that no evil effects have resulted in any case.

Case 1. Miss B., a school teacher, aged 42, referred by Dr. Clarence J. Blake, of Boston. She complained of a long standing gradually increasing difficulty in hearing, and occasional tinnitus, which interfered with her profession. At the time of her first visit, Sept 10th, the nasal fossae were clear, and the mucous membrane was dark red. The drum membranes were slightly retracted, of good color, with small light reflexes. No air would enter by Valsalva's method, or that of Politzer. As only a little air entered the tympanum with great difficulty by the catheter, the presence of a tight functional stricture of the tube was apparent. A solution of nitrate of silver was applied to the naso-pharynx, and an alkaline spray used at home.

Seven days later, the result of Valsalva inflation was zero, and that from Politzer's method very small. By catheter, the inflation was still very imperfect on the right side. Sept. 24th, the patient said her ears were better. A little air entered by Valsalva's method, more by the catheter; but the light reflexes were still imperfect. Before inflation, the watch was heard on the left at a distance of 45 inches; on the right, at a distance of 22 inches. Applications of adrenalin and silver nitrate solution were made to the naso-pharynx.

On Oct. 3rd, Valsalva's method of inflation was successful

for both ears. The presence of supernumerary light reflexes which persisted after swallowing, showed that the reflex was still imperfect. Before inflation, the watch was heard at the left, 47 inches away; at the right, 30 inches away. After inflation, the watch was heard at a distance of 37 inches. Oct. 15th, the watch was heard at the left, 60 inches away; at the right, 40 inches away. The patient felt much better. Valsalva inflation was easy for both ears, but best in the left.

On her ninth visit, Oct. 21st, the Valsalva inflation was good and equal. Oct. 28th, the drum membranes looked well. The light reflexes were good. The patient thought her ears were in a good enough condition to stop the treatment. On Jan. 3d she wrote: "Except for a fortnight, when I was unfortunate enough to be suffering from a heavy cold, my ears have remained in a very good condition. Now that the cold has disappeared, the ears seem normal again."

Case 2.—Mrs. L., 64 years, complained of impairment of hearing and tinnitus in both ears. In the left, where the trouble had begun three years before, she had at the time of her first visit, Dec. 12th, a constant roaring like the sound of a waterfall. This roaring was occasionally intermingled with sharper sounds. Inspection showed that the right drum membrane was drawn in, and dark-colored. The light reflex was very faint. In the left ear, the drum membrane had good color and a fair light reflex. The watch was heard on the right, 9 inches away; on the left, 22 inches away. The fact that Politzer's method of inflation could not inflate the right ear showed the presence of a functional stricture of medium grade. Applications of adrenalin and solution of silver nitrate to the pharynx were made.

Dec. 14th, the watch was heard on the right, at a distance of 12 inches; on the left, a distance of 20 inches. Inflation was easy by Politzer's method. Dec. 19th, the watch was heard on the right, 17 inches away; on the left 29 inches away. The same treatment was continued. Dec. 23d, the watch was heard at the left, 54 inches away; at the right, 48 inches away. The tinnitus was very faint.

Case 3.—Rev. J., age 26, complained of impaired hearing of late in his left ear, and slight ringing tinnitus. His first visit was made Oct. 25th. An examination showed that the bone conduction was much increased and that the air conduction was diminished. By air, the high notes were well

heard, but the hearing was defective for the low notes. The tuning fork was lateralized to the left. The left membrana tympani was marked by whitish atrophic areas on a clear background. Imperfect Valsalva inflation demonstrated the presence of a slight functional stricture. Treatment was given by applications of a solution of silver nitrate to the naso-pharynx.

Nov. 11th, the watch was heard at the left, 72 inches away (normal 62 inches). Applications of adrenalin and solution of silver nitrate were made to the naso-pharynx. On his seventh visit, Nov. 18th, the patient was well pleased with his improvement. The watch was heard at the left, 96 inches away. Valsalva inflation was easy in both ears. The hearing of the watch at the right was normal. On his ninth visit, Dec. 23d, the watch was heard at the left 360 inches away. Since that time, diminished hearing or tinnitus has not disturbed the patient.

Case 4.—Mr. B., aged 43, complained of impaired hearing and slight tinnitus in right ear, lasting several years. On his first visit, June 25th, the right drum membrane was retracted, the color good, the light reflex very faint. Air would not pass by the Valsalva method; by the Politzer method it entered with great difficulty. This showed the presence of a functional stricture of medium grade. Before inflation, the watch was heard at a distance of $1\frac{1}{2}$ inches; after inflation, at a distance of 24 inches. Treatment was given by applications of a solution of nitrate of silver to the naso-pharynx.

July 1st, the watch, before inflation, was heard 24 inches away; after inflation, 3 feet away. Applications of adrenalin and solution of silver nitrate were made to the naso-pharynx. July 8th, the watch, before inflation, was heard $4\frac{1}{2}$ feet away. On his fourth visit, July 22d, the patient was much improved. The watch was heard at a distance of 18 feet.

Case 5.—Mr. L., aged 24, complained of decreased hearing and tinnitus on the right side. He was referred to me with the diagnosis of commencing stapes fixation. He used to have crackling and some musical tinnitus, but now he has only buzzing and a sound like surf. His first visit was made Oct. 21st. The right drum membrane was slightly drawn in, its color and surface normal, the light reflexes broken. As inflation was imperfect by the Valsalva method, the presence of a functional stricture of at least medium grade was shown.

The acoumeter was heard at a distance of 12 inches. A solution of silver nitrate was applied to the pharynx.

Oct. 28th, the nasal mucous membrane was dark red. Valsalva inflation was imperfect. Treatment was given by applications of adrenalin and solution of silver nitrate. The patient said that for three days after the last visit he heard better, but that the tinnitus was less. Oct. 31st, there was less surf sound in the ear. The acoumeter was heard 4 feet away. Dec. 12th, the acoumeter was heard at a distance of 8 feet. Valsalva inflation went for the first time, but with great difficulty. Adrenalin and silver nitrate solution were applied to the nasopharynx. On his eleventh visit, Dec. 20th, tinnitus was hardly perceptible. Valsalva inflation was occasionally normal. The acoumeter was heard at a distance of 7 feet on the right, and the watch at a distance of 6 inches. By the left ear the watch was heard 4 feet away.

Case 6.—Mr. M., aged 41, came to me with a long history of impaired hearing and much treatment. Many years ago he had suffered from suppuration in the left ear. Since an exposure to a loud whistle blast, the hearing in the left ear had been much worse. In the right ear, buzzing tinnitus was present.

His first visit was made July 1st. The left drum appeared atrophic or scarred in several places. The right membrane was sunken, but otherwise normal in appearance. By Portzner's method of inflation, the air passed very poorly in the left ear, but went better by the catheter. This fact suggested functional stricture of the pharyngeal end of the tube. The air entered more readily into the right ear. On the left, the acoumeter was heard 3 inches away. After inflation, it was heard at a distance of 9 inches. Treatment was given by applications of adrenalin and solution of silver nitrate to the nasopharynx.

On his fourth visit, the watch was heard by the right ear 17 inches away; after inflation, it was heard at a distance of 27 inches. By the left ear, the acoumeter was heard 3 inches away. On Jan. 24th, his fifth visit was made. Before inflation, the watch was heard by the right ear 38 inches away. By the left ear, the acoumeter was heard 48 inches away. The permeability of the tubes was much improved, but not yet perfectly normal.

Conclusions: The foregoing cases, I believe, justify the following important conclusions:

1. The stricture of the Eustachian tube in aural diseases is not generally organic.

2. Non-organic strictures are easily treated by the methods employed.

XVII.

COLLODION; ITS USE WHEN THE MEMBRANA TYMPANI AND MALLEAL LIGAMENTS ARE RELAXED.*

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Since the publication of McKeown's classical paper, "The application of simple collodion to the membrana tympani in the treatment of various diseases of the ear," (British Medical Journal, 1879, page 1013), very little has been added to the experiences which he relates. He reports two typical cases of uneven depression of the drum membrane behind the malleus which bulge after inflation. These show marked improvement in hearing after the application of collodion. McKeown goes on to say that he has used collodion with good results in some cases of adhesion of the malleus and drum membrane,—in-drawn drum membrane,—irregular depressed drum membrane,—and membranes that flapped on inflation. Improvement followed in most cases. He has noted one untoward result, an instance of rupture of the drum membrane by the collodion.

Chevanne in *La Presse Oto-Laryngological Belgique*, 1904, page 416, reports a case of spontaneous rupture of the drum membrane in acute otitis, several months after the application of the collodion. The symptoms were doubtless aggravated by the increased resistance offered by the collodion which still remained in the ear.

Instigated by Dr. C. J. Blake I have tried contractile collodion in two classes of cases.

Class I. Relaxed posterior upper segment of the membrana tympani, a very common condition.

Class II. Laxity of the malleal ligaments, especially with the malleo-incudo-tympanic.

In both classes of cases some benefit was noted.

*Read at Annual Meeting of the American Otological Society, 1905.

The etiology in both conditions is similar, and they may be found co-existing. Class I is a very numerous one since its etiological factor is still often operative though not so much so as formerly. Class II is much more rare. Both classes of cases are due to over inflation and usually follow over treatment. But the same condition may also be brought about by the patient inflating the tympanum during frequent and forcible acts of blowing the nose.

When the drum membrane is naturally weak, or when the reflux of air through the Eustachian tube after inflation is much interfered with, the too frequent act of inflation will constantly keep too high a pressure on the inner side of the drum membrane, which in time will cause the drum head to yield at its weakest point. When the exciting cause is extremely active the tensor tympani seem to be paralyzed and the malleus is pushed outward with the drum head and finally the ligaments holding these ossicles in place become stretched beyond their power of recovery. Other cases arise when there is very little resistance to the reflux of air offered by the Eustachian tube after inflation, when the poor condition and nutrition of the drum membrane cause it to yield with abnormal ease to the increased intratympanic tension. This laxity interferes more or less markedly with the acoustics balance resulting in a loss of sound transmission, which is still further diminished by the lessening of the sound receptive power of the drum membrane due to a decrease of its vibratory power.

The diagnosis is easily made if the ear is inspected during or immediately after inflation. The changed position of the malleus handle and short process, when they have been moved bodily outward while the ligaments are lax, can be easily recognized, especially if they are under inspection during the act of inflation. The hyper-convexity of the posterior superior quadrant of the drum membrane usually surmounted by a supernumerary light reflex is an indication of the laxity of this portion of the drum membrane. Dr. E. A. Crockett tells me that he has often noted that musicians with this affection are annoyed by perceiving a difference in pitch of a single note, the pitch varying with the ear which perceived it.

ETIOLOGY.

These cases depend for their cause on the over stretching of the fibrous layer of the drum head due

I. To more or less narrowing of the Eustachian tube (stricture).

II. To frequent inflation of the tympanum.

III. To a drum head which is unable to withstand the increased internal tension caused by the impeded reflux of air after inflation.

Inter tympanic vacuum does not appear to be related to the causes of this affliction.

DIAGNOSIS OF CLASS I.

As will be seen, the hearing in these cases is very likely to improve while the drum membrane is kept tense by the act of inflation, the improvement being only momentary or of brief duration. On inflation, the posterior superior segment of the membrane is seen to bulge forward more than the rest of the periphery of this segment. The presence of the supernumerary light reflex is pathognomonic of this lesion of the drum head.

DIAGNOSIS OF CLASS II.

During the act of inflation the whole membrane will be seen to move outward together with the handle and short process of the malleus.

PROGNOSIS.

In most cases where care is used in the application of a collodion splint, the hearing distance is at once increased. In some cases, however, the hearing distance is at first slightly diminished, and does not increase until the collodion has separated from the drum membrane, which may require six or eight weeks or even longer. The tension of the ligament and drum membrane tends slowly to return. If the treatment is continued for a period of from six months to a year, the results are permanent, provided the exciting cause is abolished.

Prognosis of the relaxation when neglected is very bad as long as the exciting cause is operative. The tendency is for the condition to increase. If the exciting cause is removed, the improvement, if any, is extremely slow. When the drum membrane is protected by the collodion, the tension gradually improves, and the length of time required for its entire recovery depends upon its nutrition and the degree of laxity.

TREATMENT.

I. Avoid the exciting cause, inflation.

II. Apply a collodion splint to the relaxed portion of the drum head.

III. Make the Eustachian tube patulous if it is not already so.

Collodion is painted upon the drum membrane, the area to be covered depending upon the conditions. If the ligaments are relaxed the whole upper half of the drum membrane should be coated. Where the relaxed area is confined to the upper superior segment the collodion should be applied only to this region. The amount of collodion applied should be carefully gauged to avoid seriously inconveniencing the patient or causing any damage to the drum head.

DANGERS.

Discomfort or pain may be due to the contraction of a too abundant application of the collodion. Rupture of the membrane was noted by McKeown. The increased resistance of the membrane due to the collodion may seriously complicate an intercurrent, untreated middle ear inflammation. The increased weight and stiffness of the drum head with the collodion may diminish the hearing temporarily.

Case 1.—Rev. Mr. X, 26 years old, in good health, noted deterioration of hearing in left ear. Upon examination the nose and throat were found normal. The left drum membrane was slightly retracted, and very transparent. He complained of a slight tinnitus and occasionally a buzzing in the ear.

Valsalva inflation was slightly retarded and showed bulging of posterior superior quadrant of the membrane with a supernumerary light reflex on the periphery. Air conduction slightly decreased with some loss of low tones. Bone conduction slightly increased, tuning fork on vertex lateralized to the left. Watch heard at distance of six feet. On application of collodion distance immediately increased to ten feet. Next visit, watch heard at fifteen feet after application of collodion. Third visit, heard watch twenty feet, after further application of collodion heard it thirty feet. Patient was then satisfied, as he heard watch only twenty-five feet with the other ear.

In two months the patient reappeared with same complaint of diminution of hearing in left ear following cold in the head. Heard watch four feet with the left ear, and twenty feet with the right ear. Valsalva inflation slow in both ears and showed over distension of the left drum membrane as before. Complained at this time of a decrease of hearing in right ear as well as the left. Application of collodion increased

hearing in left ear to five feet, another application brought it up to twenty feet.

A month later patient appeared with another cold and the usual symptoms in the left ear. Tuning fork strongly lateralized to the left. Left tube abnormally patulous. Valsalva on right was very difficult. Patient said left ear felt clogged but the right one felt like a hole. Collodion applied to the left drum membrane made this ear feel like a hole too, and hearing was increased to thirty-six feet immediately. Since that time patient has retained his normal hearing with the exception of two similar attacks a month apart.

Case 2.—Business man, 41 years old. Patient had previously had treatment many years for the ears and nose. On first examination heard acoumeter six inches in left ear. Heard better during noise. One application of collodion increased distance to thirty-two inches. Drum membrane of left ear showed over distension with supernumerary light reflex on superior posterior quadrant. Valsalva slow, membrana tympani very thin.

Case 3.—Business man, 43 years old. Total deafness in right ear following suppuration. History of long standing deafness in left ear from nose pharyngeal trouble. This case is remarkable on account patient experiencing no tinnitus. Inspection showed the presence of an adhesive process in left ear. The left tube was patulous. Valsalva inflated very easily and reflux of air not interfered with. During the inflation the posterior superior segment of the membrane tympani was seen bulging forward with a light reflex on its convexity. Acoumeter heard at seven inches.

Collodion was applied over the bulging area at intervals for six visits. Hearing improved gradually until the last observation eight weeks after the first one which gave the result of hearing the acoumeter at forty-two inches. Several observations were made previous to the treatment showing that the hearing increased one hundred per cent when the membrane was tense during inflation.

Case 4.—Society lady, came from Dr. C. J. Blake for continuation of treatment instituted by him and returned to him for its completion. The left ear showed relaxation of the drum membrane superiorly and posteriorly, on inflation. There was a supernumerary light reflex along the periphery of the membrana tympani. Air reflux slow. On the eighth of Feb-

ruary patient could hear acoumeter four inches in the left ear. Collodion was applied on four occasions and on March first the acoumeter was heard thirty inches.

Case 5.—Woman stenographer, 32 years old. History of long standing deafness and tinnitus with much treatment. The Eustachian tubes were previously closed, but had been permanently opened by the electric bougie, and at time of my first examination they were perfectly free. Membranes were white but thin, malleus handle slightly retracted, and light reflex small. On Valsalva inflation the upper and posterior parts of the membranes bulged forward carrying the short process of the malleus with it. The hearing was very much increased during this procedure, but immediately went back to usual distance. The patient was in the habit of inflating her ears to enable her to hear ordinary conversation. Acoumeter was heard twenty-six inches in the right ear. After collodion application it was heard forty-eight inches. In the left ear the acoumeter was heard twenty-three inches. During Valsalva inflation it increased to fifty-four inches. On the relaxation of the tension of the tympanum it immediately fell to the former distance. After the application of collodion it rose to seventy-two inches. This case belongs in Class II because it has relaxed ligaments.

CONCLUSIONS.

When the Eustachian tube is not perfectly patulous there is a possibility of overcoming the natural elasticity of the drum membrane by too frequent inflation, which may even also cause laxity of the ossicular ligaments.

Treatment of this condition by the use of collodion offers an encouraging prognosis.

Untreated the condition has little tendency to spontaneous cure but rather to an increased defect.

XVIII.

MANUEL GARCIA.*

BY JOHN W. FARLOW, M. D.,

BOSTON.

To-day there was celebrated in London the one hundredth anniversary of one who, still living and active, has well been called the father of laryngology. There is probably no laryngological society in the world which has not sent its letter of congratulation to the distinguished centenarian, Manuel Garcia, in recognition and appreciation of the great service which he rendered to the whole world by his successful laryngoscopic examinations of the larynx, and his paper entitled "Physiological Observations on the Human Voice," which gave such impetus to the examination, diagnosis and treatment of laryngeal disease that speculation and deepest ignorance soon gave way to the science of laryngology.

Let us inquire what his antecedents were, what sort of a man he was and what led him, who was not a medical man, but a singing teacher, to make his experiments on the larynx. According to Chorley, the great English musical critic, the Garcias were a Spanish family of musicians and representative artists whose power, genius and originality have impressed a permanent trace on the records of the methods of vocal execution and ornament. The father of Manuel Garcia¹ was Manuel Garcia del Popolo Vicenti, born in Seville, Spain, in 1775. He began his artistic life at six years of age as chorister at the cathedral, and studied music under the best masters of Seville. At the age of seventeen, he made his debut at Cadiz in an opera of his own composition. Later he went to Italy and studied

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¹Sir Felix Semon in an article published in the *Centralblatt für Laryngologie* states that Garcia was not the true family name but was adopted as a stage name. The family name was Rodriguez.

the Italian method. He appeared in opera in Paris in 1808, where he was received with much applause and his style of singing was greatly appreciated. In 1824, he went to London and thence to New York, in 1825, with a company of excellent artists, among them his son, Manuel, and his daughter, Maria, better known under her subsequent name of Malibran, one of the most famous opera singers the world has ever known.



Fig. 1. Manuel Garcia.

They appeared in Italian opera in New York with much success, and later went as far as Mexico. They were on the point of returning to Europe, when he was set upon by brigands, on the way to Vera Cruz, and robbed of his well-earned wealth, about thirty thousand dollars. He had hoped to found an Italian theatre in New York, but the loss of all this money compelled him to return to Paris, where he soon retired from

the stage and devoted himself exclusively to teaching, until his death in 1832. His method of singing was unsurpassed, and some of the most celebrated singers were his pupils, among them his son, Manuel, his daughter, Mme. Malibran, whom I have already mentioned, and also his daughter, Pauline, Mme. Viardot, who became very famous as an opera singer. He wrote excellent treatises on the art of singing.

His son, Manuel, was born in Madrid, March 17, 1805, just one hundred years ago to-day. He studied music under various teachers in Madrid and Paris and later under his father. His lessons were interrupted in 1825, when he was twenty years old, by his journey to New York with his father's opera company, in which he sang second bass. After his return to Europe he gave up the theatre and assisted his father in teaching singing at Paris. He studied seriously the conformation of the vocal organs, the limits of the different registers of the voice and the mechanism of the larynx in singing and presented the subject at the Academy of Science in Paris in 1840, in a work entitled "*Memoire sur la Voix humaine*," and received the congratulations of the Institute for it. He was Professor of Vocal Music at the Paris Conservatory of Music from 1842 to 1850, and published a book in two parts on singing, for the use of pupils and especially of teachers, an excellent work containing many novel ideas. In 1850, he went to London and became Professor at the Royal Academy of Music. His wife, whose maiden name was Eugenie Mayer, was one of his pupils and became a noted opera singer. He has trained the voices of many of the most famous artists, among them Jenny Lind. Of late years he has lived in London and his address is Mon Abri, Cricklewood, London. We see that he was no ordinary music teacher. Of a distinguished musical family, he had been interested in the throat, the larynx and the voice for many years and had published, as early as 1840, a treatise on the voice worthy of the commendation of the French Academy.

Let us look for a few moments at the attempts of the predecessors of Garcia to see the larynx in the living, human subject. In these days, when the study of laryngology is compulsory for a medical degree, and when every student is obliged to have a fair amount of attainment in the use of the laryngeal mirror, it seems strange to read, in an article published by Yearsley in London, in 1862, seven years after Garcia's paper

and four years after Czermak's demonstrations, that he feels that the subject is such an important one that he hopes there will be in every large city at least *one* practitioner who is expert in the use of the laryngoscope.

It is probable that dental mirrors had been used at intervals from time immemorial for examining the teeth, and polished tubes for looking into the external canals are of very ancient origin. Many of you have, doubtless, seen the various specula unearthed at Pompeii. But it is necessary to have illumination as well as a reflecting mirror in order to see down into the larynx, and, as Mackenzie well says, "the fact that it was not till comparatively recently that physicians attempted to discriminate between diseases of the fauces and those of the wind-pipe, may account for the non-appearance of the laryngoscope at an earlier date. There is no evidence of a laryngoscope before the middle of the eighteenth century."

About 1743, M. Levret, a French accoucheur, devised a sort of speculum to aid him in removing polypi from the nose and throat by ligatures. It was a plate of polished metal which reflected the luminous rays in the direction of the tumor and also received the image of the tumor. This was evidently merely something to enable him to see how to tie his ligatures, and he made no real use of it to see the larynx.

Nearly sixty years later, in 1804, Bozzini of Frankfort, Germany, devised a tube for illuminating the various canals of the body. The title of the book was "The Light-Conductor, or Description of a Simple Apparatus for Illumination of the Internal Cavities and Spaces in the Living Body." An absurd idea was commonly held that the apparatus would permit an inspection, not only of the outlets of the body, but even the internal viscera. The medical faculty, particularly that of Vienna, was down on him for his pretensions and styled his instrument the "Magic Lantern in the human body."

His invention, of which I show you a drawing, consisted of two essential parts, first a kind of lantern and second a number of hollow metal tubes (specula) for introducing into the various canals of the body. The lantern was vase-shaped, made of tin, in the center of which was a small wax candle. In the sides of the lantern were two round holes, a larger one and a smaller one opposite each other. To the smaller, an eye piece was fixed, and to the larger the speculum. The flame of the candle was situated just below the level of these

two apertures. The mouth of the speculum, a tube of polished tin or silver, was always of the same size, but the diameter of the tube beyond the orifice varied according to the size of the

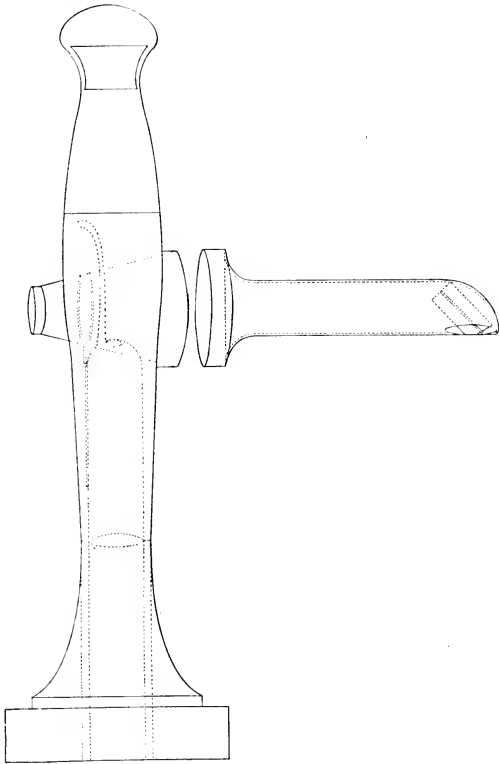


Fig. 2. Laryngoscope of Bozzini, showing the vase-shaped lamp with candle inside. The speculum with the two small mirrors at the bend is to be attached to the larger opening in the side of the lamp. For looking down into the larynx, the small end of the speculum is directed downwards, and it can be turned upward when the post-nasal space is to be examined.

canal into which it had to be introduced. The apparatus was about thirteen inches high and at the downward bend of the

laryngeal tube were two mirrors. In employing reflected light he had the speculum divided by a vertical partition, so that there were two canals and two mirrors, one to convey light and one to receive it.

Later I will give some of the objections to the value of such tubes in the throat. Suffice to say here, that nothing of value came from its use in the throat.

In 1827, Dr. Senn, of Geneva, had a little mirror constructed for introduction to the back of the pharynx, with which he tried to see the upper part of the larynx, but he gave up its use on account of the small size of the instrument.

In 1829, Dr. Benjamin Guy Babington, at a meeting of the Hunterian Society of London, showed an instrument, not very unlike the laryngoscope now in use, for examination of the parts within the fauces not admitting of inspection by unaided

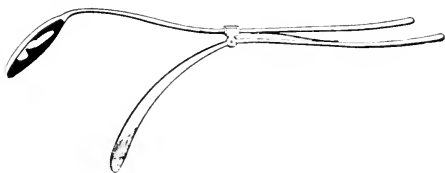


Fig. 3. Glottiscope of Babington, showing the laryngeal mirror and the tongue depressor.

sight. He used two mirrors: one, the smaller, for receiving the laryngeal image in the throat, and the larger for concentrating the solar rays on the first one. The patient sat with his back to the sun, and, while the illuminating mirror (a common hand looking-glass) was held in the left hand the laryngeal mirror was introduced into the mouth with the right hand. By a simple mechanism, a tongue depressor was united with the laryngeal mirror and thereby one of the most serious obstacles to laryngoscopy was attempted to be overcome. A spring was fixed between the shank of the laryngeal mirror and the spatula in such a way that by pressing the two handles together the tongue was depressed. At a later period he gave up the combination of mirror and spatula and had mirrors made which resembled those now in use. They were of polished steel inclined to the shank at an angle of about 120° . Though he used his mirrors on many patients, there are no

cases recorded in which it was employed. He made a decided advance over Senn, who used merely a laryngeal mirror and no mirror for throwing in light. The difference between Dr. Babington's glottiscope, as he called it, and the one now in use is that, while in the latter the light is thrown on the laryngeal mirror by a circular mirror attached to the forehead of the operator, in the former the illuminating was effected by a mirror held in the operator's left hand and also no artificial light was used.

In 1832, Dr. Bennati, of Paris, asserted his ability to see the vocal cords. A mechanic named Selligue, who was suffering from tubercular laryngitis, had invented a double-tubed speculum, of which one tube served to carry the light to the glottis, and the other to bring back to the eye the image of the glottis reflected in the mirror placed at the pharyngeal end of the tube, and his larynx was examined and treated by Bennati by means of this apparatus.

Trousseau, the great French clinician, had a similar tube made for himself, but found it of very little value, as not more than one patient in ten could tolerate it. He says, "it is of such a size that it fills up the space between the free edge of the soft palate and the tongue. It causes gagging, retching and closure of the pharynx, which prevents a view of the parts lower down," and he asserts that "Bennati is in error in saying that he has seen the glottis with the speculum of Selligue. He saw only the upper part of the epiglottis and very rarely the superior entrance of the larynx and that only when the accidental straightening out of the epiglottis permitted." Trousseau recommends, instead, a digital examination of the larynx, which shows what he thought of specula.

In 1838, Baumes showed at the Medical Society of Lyons a mirror about the size of a two-franc piece, which he described as very useful for examining the posterior nares and larynx, but no cases are recorded.

In 1840, Liston, a Scotch surgeon, in his work on practical surgery, in treating of edematous tumors which obstruct the larynx, says: "The existence of this swelling may often be made out by a careful examination with the fingers and a view of the parts may sometimes be made out by means of such a glass as is used by dentists, on a long stalk, previously dipped in hot water, introduced with its reflecting surface downward and carried well into the fauces." Although much credit

has been given to Liston, it is obvious that he never contemplated an inspection of the vocal cords. It is plain that he thought the sense of touch was more to be relied on than that of sight, and he evidently referred to the epiglottis rather than the parts below.

In 1844, Dr. Warden, of Edinburgh, reported two cases in which he had been able to see the glottis by means of a tube and two prisms, one for throwing light into the tube and the other placed in the pharyngeal end of the tube for deflecting the light down on to the glottis. To facilitate the examination

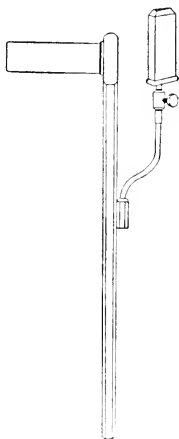


Fig. 4. Laryngoscope of Warden. A hollow canula with a long handle to which is attached a prism. This can be turned in various directions in order to divert the light from a lamp into the canula. A small prism with a metallic handle is then passed along the floor of the canula to its laryngeal end, where it serves to divert the light down to the larynx. This second prism is not shown in the figure.

(which the patient evidently found rather strenuous) he advised quieting the irritability of the throat by touching it with the finger, depressing the tongue, dilating the fauces and encouraging the patient to swallow in order to lift up the arytenoids and the epiglottis. Such a method was of no practical value.

In 1844, Mr. Avery, of London, made use of a circular reflector, perforated in the center, for concentrating the light on a laryngeal mirror. This was attached to a head-band worn by the operator. The reflector was five inches in diameter and the apparatus worn on the head weighed a pound. The small laryngeal mirror was placed at the end of a speculum, as in Bozzini's case, but it was very difficult to use on account of its irritating the throat. No cases seen with this instrument are recorded, and it was not published until after Garcia's paper.

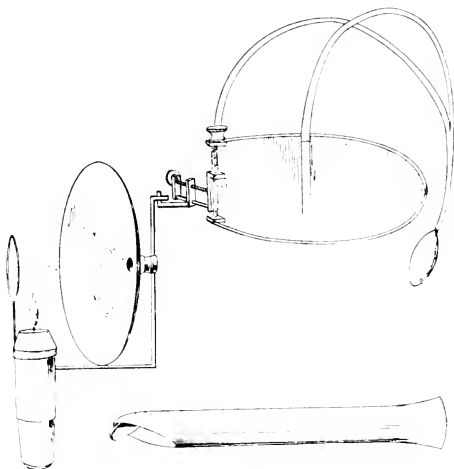


Fig. 5. Avery's Laryngoscope. Head band, mirror, lamp speculum with mirror inside, handle of small mirror not shown in figure.

All the experiments up to this time had produced no practical result as far as knowledge of the larynx was concerned. The larynx as a whole had probably never even been seen and, consequently, the physiology and pathology of the organ were no further advanced than in the early part of the nineteenth century. An isolated, incomplete examination, followed by no theoretical or practical advantage, merely a medical curiosity, which did not impress even its inventor as having any special

value,—such was the state of knowledge, or rather ignorance of the living larynx, when, in 1854, while on a vacation in Paris, Manuel Garcia undertook a series of laryngoscopic examinations on himself for the purpose of studying the action of the larynx in the production of the voice. He was unaware of what had been done by his predecessors; in fact, they had not done much that could help his studies.

"One day in September, 1854," he says, "when I was sauntering about the Palais Royal, busied with the wish often put aside as unattainable but yet always urgent, namely, to see the glottis during the act of singing, I suddenly saw both mirrors of the laryngoscope in their respective position as clearly as if my eyes actually beheld them. I immediately hastened to Charriere, the instrument maker, an in answer to my inquiry if he happened to have a little mirror on a long handle, he replied that he had a small dental mirror which had been exhibited in the London Exposition of 1851, but which had been found unpractical. I bought it for six francs. After procuring a small hand mirror, I hastened home in great impatience to begin my experiment. I laid the little mirror, which I had warmed in hot water and carefully dried, on my uvula, and with the hand mirror concentrated a beam of sunlight on its surface. To my great joy, I saw the glottis widely open and so distinct that a portion of the trachea was visible.

"When my initial excitement had subsided, I began to examine what was presented to my eye. The form and manner in which the glottis opened and closed noiselessly and its movements in phonation filled me with astonishment."

He was the first to conceive the idea of an autoscopic examination. He directed that the person experimented on should turn towards the sun so that its rays falling on the little mirror in the throat should illuminate the glottis. He also said that if the observer experimented on himself he should, by means of a second mirror, receive the sun's rays and direct them on to the throat mirror. He occasionally advised the use of a perforated head mirror, when he was being examined by another person.

In 1855, just fifty years ago, he presented before the Royal Society of London his paper entitled, "Physiological Observations on the Human Voice," which contained the first, and a very admirable, account of the action of the cords in inspiration and vocalization, some very important remarks on the pro-

duction of sound in the larynx and also valuable reflections on the formation of chest and falsetto tones.

This paper created little stir at the time, and was treated with apathy, if not incredulity. It was known that he had a very tolerant throat which he, as a trained singer, had under perfect control, and his observations were thought to be merely personal and not of universal application. The fact that he was not a medical man may have lessened the interest of physicians in this epoch-making discovery.

His paper, however, passed into the hands of Türk of Vienna, who, two years later, in 1857, during the summer months, employed the mirrors and methods of Garcia on himself, and also at the Vienna General Hospital; but the uncertain light and the frequent absence of sun made him inclined to lay aside his studies, and he even declared that he was "far from having any exaggerated hopes about the employment of the laryngeal mirror in practical medicine." He was a fine musician and an able physician and was much helped in the publication of his classical work on "Diseases of the Larynx," which he published later, by Dr. Effinger, a noted watercolor artist, who illustrated the conditions seen in the laryngoscopic cases which came under Türk's care after the method had been perfected by Czermak.

This final step in the progress of laryngoscopy was made by Czermak, Professor of Physiology in Pesth, in Hungary. He had a very large pharynx, small tonsils and uvula, and was a splendid subject for laryngoscopy.

In order to study the production of certain guttural sounds, such as occur in the Arabic language, in 1857, he borrowed from Türk the little mirrors which the latter had thrown aside as useless. In order to be independent of the sun and weather, he substituted artificial light for sunlight and made use of the large concave, ophthalmoscopic mirror of Ruete for concentrating the luminous rays. Full of enthusiasm, he made journeys to Germany, France and England, journeys which were considered impossible, at that time. By his demonstrations on himself and others, he compelled an interest and knowledge of this new discovery, and at this time the "Science of Laryngology" took its origin. In 1858, he published his first essay, entitled: "Physiological Researches with the Laryngeal Mirror of Garcia," thus showing the importance he attached to the work that had been done by Garcia.

At the time of Czermak's great activity a marked controversy arose between him and Türk in regard to various questions of priority in the use of these mirrors and methods. The rivalry, unfortunate for the two individuals, had the effect of attracting attention to the subject and, in a way, was a means of making known the merits of this new mode of diagnosis and treatment.

It would be unpatriotic did we not mention a fact, probably unknown to most of you, that Massachusetts has also had a small share in the history of laryngoscopy. In January, 1858, Dr. Ephraim Cutter, of Woburn, Mass., in conjunction with Mr. G. B. Clark, of Cambridge, the noted lens and telescope maker, devised a laryngoscope similar to that of Bozzini. It consisted of two tubes, one for observation and the other for illumination, and at the oval, pharyngeal end was a prism to divert the rays of light into the larynx. I can show you a drawing of Cutter's proposal and also of what Clark wished to substitute, but I am not aware that it came to any practical use. Perhaps some of the older members of this society may know something of its fortune.

Looking over the various experimenters whom I have mentioned, we may say, in a general way:

(1) Bozzini first attracted attention to the importance of seeing into the different cavities of the body, and to some extent succeeded.

(2) Babington was, in a certain sense, the discoverer of laryngoscopy.

(3) Baumes, Liston, Warden and Avery made apparently independent efforts to examine the larynx.

(4) But to Garcia is due the merit of having first made an extended series of examinations of the healthy larynx.

(5) And to Czermak must be awarded the praise of having diffused the knowledge of the instrument and shown its value in the study of disease.

The tubes and specula had no practical result. The mirrors of Babington and Liston and the illumination of Avery were not so very unlike what we have to-day. But no knowledge of the larynx, no literary contribution, came until Garcia.

As a singer, he had learned to depress the base of his tongue, but he did not advocate in examination the drawing forward of the tongue by the left hand of the operator, and, consequently he generally failed to see the anterior part of the

cord. Fortunately, it is the posterior part where most of the motion in speaking and singing takes place, hence he was able to publish his very complete paper on the "Human Voice." In this paper, read before the Royal Society in London in 1855, he says: "At the moment when the person draws a deep breath, the epiglottis being raised, we are able to see the following series of movements: the arytenoid cartilages become separated by a very free lateral movement, the superior ligaments are placed against the ventricles, the in-

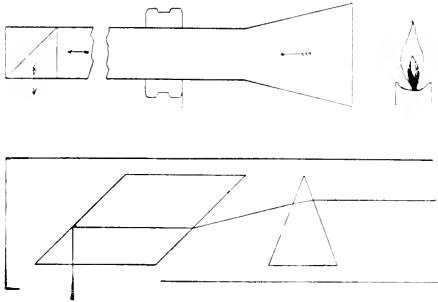


Fig. 6. Cutter's Laryngoscopic Tubes. Upper one with prism inside is Cutter's idea for illumination of the larynx, and lower one with two prisms is Clark's suggestion.

ferior ligaments are also drawn back, though in a less degree, and the glottis, large and wide open, is exhibited so as to show in part the rings of the trachea. As soon as we prepare to produce a sound the arytenoid cartilages approach each other and press together by their anterior surfaces without leaving any space. Sometimes they even come into so close contact as to cross each other by the tubercles of Santorini." These are certainly the words of one who has seen critically, exactly and repeatedly, not only the epiglottis, but the cords

and the whole larynx. He gave also very valuable information on the chest, head and falsetto registers, and showed that the vocal cords and not the ventricular bands exclusively form the voice, whatever its register or intensity. Although not a medical man, his work was considered so valuable that he was given an honorary degree of M.D. by the University of Königsberg, in Germany.

I have tried to bring before you a few facts in regard to the artistic and highly musical antecedents and surroundings of Manuel Garcia; his great success as one of the most famous teachers of singing in the world, his painstaking studies of his own larynx, after so many others had failed or their efforts had resulted in nothing of value; his noteworthy paper before the Royal Academy, the first *expose* of the appearance and action of the living human larynx; his honorary medical degree; the fact that his mirrors were used by Türk and Czermak, who, especially the latter, amplified and improved the art; and more especially by his demonstrations and journeys made known to the medical world the possibility of seeing and treating the larynx and thus making possible the science of laryngology and rhinology.

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XIX.

AN ADDRESS ON THE CAUSE AND TREATMENT OF HAY-FEVER.

BY PROF. DR. WM. DUNBAR,

HAMBURG.

Gentlemen: The disease of which I will speak today, in response to the invitation of your honored chairman, can be designated as a thoroughly modern condition.

Medical literature has known it for almost one hundred years through a work of Bostock's. The question as to whether it had existed for some time before then cannot be definitely answered. At least it was not very widely distributed one hundred years ago, which is proved by the statistics of Moebius and others. Even a few decades ago, according to the views in which all authors coincide, the disease must have been a comparatively rare affection. At the present day its victims number hundreds of thousands. In the United States of America alone, where, as is well known, this disease does not occur in the spring exclusively as in our country, but is especially prevalent in fall, the number of hay-fever patients is given by many physicians as at least one million. This, however, may be an exaggeration. It is a fact, however, that many American physicians of whom I have asked the question are of the opinion that there is scarcely a family in North America in which there is not one or more members who suffer from hay-fever.

Even in Germany the number of hay-fever patients is without doubt among the thousands.

If it is asked why this affection receives so little attention considering the large proportion of patients, the question can best be answered by a reference to sea-sickness. In this, too, the patient finds no sympathy among his companions. No matter how ill he is, every one knows that the patient within a short time will again be hale and hearty and every one amuses

himself more with the disease than he concerns himself with striving to cure it. In other ways also there is a parallel with sea-sickness. Just as in the latter, so the hay-fever patients, when their disease is at its height, do not care whether they live or die.

As is well known the attack of hay-fever in the spring does not at once appear with its greatest severity. The first symptom is a prickly sensation in one or both canthi, which can be compared to the sensation experienced when touching nettle. Then in one or both nares a similar feeling appears. Then appear injection of the conjunctiva and lacrimation. The patient begins to sneeze and the mucous membrane to secrete. The sneezing attacks at times may be so numerous as to follow each other in great frequency. Then the nose becomes more and more impermeable for air, in consequence of the swelling of the mucous membrane. Correspondingly the chemosis of the eye increases until the mucosa protrudes through the orifice of the lids. The patient can no longer breathe through his nose. Not only does he complain in eating and sleeping, but in addition, this prickly feeling extends into the palate and throat, the patient becomes hoarse, bronchitis develops and asthma in many patients. Other patients suffer with symptoms similar to migraine. The patient becomes dizzy and can scarcely remain seated on a chair. Every mental faculty is as good as lost. He can scarcely interest himself in the newspaper, while the ocular symptoms make reading difficult.

The patient may remain for weeks at a time in this condition. Every medication that has been used—and there is scarcely a drug that has not been tried by hay-fever patients—has been found by most patients to be of no use. Suddenly, in Germany usually about the middle of July, the condition becomes better of itself and within a few days the hay-fever patient seems entirely normal without experiencing any evil result from his severe disease. It is this result as I have said, that has kept the medical fraternity, as well as the rest of mankind, from regarding hay-fever as a very serious condition.

But when we remember that those patients are affected by hay-fever who are subject to mental exertions, and who hold responsible positions, it is speedily seen that hay-fever is a vital question for many of its sufferers. If we think of the preachers, teachers, merchants, physicians, especially surgeons—professions, all of which possess a large number of hay-

fever patients—or of officers—hundreds of whom seem to suffer from hay-fever, it is at once clear how hay-fever becomes a factor in the patient's occupation. More than one officer has written to me that nothing was left for him except to obtain his discharge on account of hay-fever. More than one hay-fever patient has told me that many a time, when night after night he could obtain no sleep, he had determined to put an end to his life.

The picture which I have just drawn for you shows nothing especially characteristic. In those who do not suffer from asthma, it resembles a severe cold. The only characteristic feature is that it appears periodically at a definite season, and that the period of the disease in one and the same neighborhood is the same year after year, with the difference of a few days. The period of the disease, however, is different for different zones. For example, in Italy, hay-fever begins in April, in Germany, at the beginning of June, in Scotland, still later. The length of the disease in the different zones is about the same, namely four to six weeks.

It is easy to understand that the attempt to explain the cause of hay-fever should first consider the periodicity of its appearance. In many ways, this important factor has not received sufficient attention. The oldest theories are based upon the early heat of the summer; others add to this the presence of dust, but, very early, attention was directed to certain plants which bloom at the very time when hay-fever appears. Reference was repeatedly made to the bloom of the grasses, which Elliotson, as early as 1831, considered the cause of hay-fever. For many years, this theory of Elliotson was everywhere accepted, especially since Blackley supported it by extensive investigations which showed that at the time of hay-fever the air was very rich in the pollen of the grasses.

Later on, many objections were urged against the pollen theory. It was held that hay-fever was due to local changes in the nose, especially in the mucous membrane, or to a disease of certain nerve endings in the nose or maxillary sinus. Many, of whom Helmholtz was the first, considered hay-fever as an infectious disease caused by bacteria. A few years ago, the bacteriologic explanation of hay-fever was without doubt the most widely accepted. I must admit that I myself for many years accepted this theory, especially after I was able to obtain from the mucous membrane of hay-fever patients

certain bacteria in so-called pure culture, which were absent before and after. Every bacteriologist knows how difficult it is to free oneself from the bacteriologic theory when such findings are reported. I could not, however, obtain the slightest hay-fever symptoms with my bacteria. This made me doubtful.

Certain observations kept recurring to me which could not be explained by the bacteriologic theory. When a disease is found that under certain circumstances breaks out suddenly and violently, then disappears in a few hours, or even more quickly, it is difficult to believe that a bacterial influence is the origin. Such an observation I accidentally made during a trip in April through upper Italy. I suffered from a severe attack of hay-fever, lasting a half hour, during a ride from Venice to Meran, i. e., only so long as the train was passing through a region where grass was blooming. I made similar observations while taking walks through the woods. In places where the grass was blooming an attack of hay-fever suddenly developed. This disappeared within an hour after I had left the affected neighborhood.

The following circumstance has time and again led me to make hay-fever experiments. Whenever, in June, I sat down under a certain tree in the garden, I was always certain to be attacked with hay-fever within a few minutes. As soon as I went into the house and closed the doors and windows, the attack disappeared. This repeated observation made it clear to me that the air under this tree contained something which was able to cause attacks of hay-fever. I did not fail to make experiments to discover the constituents of this air. It happened while I was making a trip in the middle of June, 1902, from Hamburg to Berlin and back, in spite of a total absence of wind I saw a thick cloud of dust over a field of blooming rye. I was informed that it was the pollen of rye. During the trip, by closing and opening the windows, I could clearly see how the entrance of air would cause an attack of hay-fever or increase its severity. This observation determined me after my return to make experiments by direct employment of the pollen, to determine the question whether the pollen of plants possessed etiologic relation to hay-fever.

If I brought the flowers of the rye or other grasses, even before the pollen had developed, into the laboratory and put them into a warm place in water, and when possible in the sun

light, the spikes on the very next day were frequently found covered with pollen which was released on the slightest movement. Under certain circumstances, it was possible to obtain pollen in this way entirely free from bacteria. In our first experiments this seemed to be an imperative condition. Later on, as will be seen, it was possible to outline a method which did not demand an absolute absence of bacteria. If I put a small, scarcely visible mass of grass pollen on the ocular or nasal mucous membrane of a hay-fever patient, there appeared in a few moments the changes described above. First appeared the characteristic subjective symptoms, in the form of the peculiar prickly, burning sensation followed by injection of the vessels, secretion of tears and chemosis. In the nose the corresponding symptoms appeared, including repeated sneezing, in the same sequence as in the natural attacks of hay-fever. In normal persons the use of large quantities of pollen was without result.

This experiment gave rise to the question as to whether hay-fever patients were more sensitive to mechanical disturbances than other people. Experiments which we made with rust and dust showed that the hay-fever patients were no more sensitive than normal people.

The method of application just described was not a very fortunate comparison with the natural process. For this reason the hay-fever patients and the unaffected individuals were requested to take their places in a large glass cabinet into which active pollen was blown, at first through glass tubes and later through ventilators. These experiments also resulted in the absence of irritation in normal people, while in hay-fever patients there was a severe attack in every case.

The idea that pollen grains were the cause of hay-fever was suggested by the fact that the surface of many pollens was covered with sharp prickles. It was thought that these prickles were too small to irritate normal people but that the very sensitive hay-fever patients were mechanically irritated. It was actually found, however, that the surfaces of many active grass pollens were entirely smooth. Although the pollen with smooth surfaces irritated hay-fever patients intensely, certain pollen grains with sharp pickles had absolutely no effect on the same patients. If a small amount of grass pollen was injected under the skin of a hay-fever patient, there appeared the above described characteristic hay-fever symptoms in the mucous

membrane of the eyes and nose, even in those cases where the injection was made in the forearm. This was followed by cough and asthmatic symptoms. The whole face swelled up and the veins became prominent, a sensation of tickling was felt in the ear, followed by tinnitus. Then there was palpitation of the heart. Some hours after the injection the entire body was covered with an urticaria. These symptoms disappeared in 24 hours. A swelling of the forearm with redness and feeling of heat spread from the point of injection. These changes disappeared only after several days. Although only a small amount of the pollen was used, these symptoms had a very grave character. In normal people, the injection of the same amount of pollen had no effect.

I should like to add here, that on the skin of the finger of the hay-fever patient, at the place where pulverized moist pollen had been lying, there were found erythematous changes, while for days at a time there was a feeling as though the finger had been pricked with a needle. The same symptoms were found when the pollen was applied to the mucous membrane of the rectum.

Taking these observations together, it is clear that every etiologic theory is without value that explains the origin of hay-fever by the sensitiveness of individual nerve endings, such as the endings of the trigeminus, or other lesions or changes of a local character, such as obstructions of the nasal passages. Especially can it be considered as excluded by my experiments, that any special sensitiveness to mechanical irritation is the cause of hay-fever. Nevertheless, the pollen of the grasses, although they are not the cause yet they are a cause of hay-fever, or contain a cause.

On the conclusion of the above experiments, I attempted to find out whether the active substance lay in a chemically characteristic constituent of the pollen, that is, whether the action was a chemico-physiologic one. As is well known, the pollen of plants contains cells surrounded by one or more membranes. The surfaces of the external membrane show, as already mentioned, projections of different kinds, such as hooks, pricks, needles, etc., or they are entirely smooth, as in the case of the grasses. The membranes consist of cellulose. They are wax-like substances as though imbedded in ethereal oil. The content of the pollen grain is called fovilla. In many varieties these are numerous granules or rods consisting of starch. The

pollen of the grasses is often filled with such rods, which under 300 to 500 magnification may be taken for bacteria. Furthermore, in the pollen there have been found water, mineral substances, cutin, suberin, nitrogenous substances of a non-albuminoid nature and albuminous substances. Pollen has also been found to contain numerous enzymes. These little microscopic bodies are chemically very complicated. By treatment of a large amount of pollen, it is possible to isolate the substances just mentioned.

Many authors in the past few years have suggested that the cause of hay-fever is to be found in certain emanations, smells or ethereal oils which are given off by the flowers of many plants.

If a large quantity of active pollen is collected, it will be found that they have no special smell aside from a slight malty one. It is a fact that the ethereal oils of the pollen cause an intense irritation of the human mucous membrane, but their effect is not only upon hay-fever patients, but also on normal people. Therefore they cannot be considered the cause of hay-fever. Ethereal oils are found in such small quantities in the pollen, that under normal conditions there is no possibility of an irritation.

For a time, I ascribed an etiologic factor to the starch rods. They were found, in my first experiments, especially prominent in the active pollen. Their solubility agreed wonderfully with that of the poisonous substance to be described hereafter. Later, I was able to show that many active pollen grains had no starch rods at all. Furthermore, as soon as I worked with large quantities of pollen which had remained in my possession for some time, I was able to isolate the starch by repeated centrifugalizing and washing, and to show that they had absolutely no influence on hay-fever patients. My earlier belief that the so-called starch rods contained albumin also, was thus disproved by these experiments. By salting out the pulverized pollen, it was possible to remove the active agent completely. If the fluid was allowed to stand for some time and then centrifugalized, the precipitate was found after washing to be entirely without action. If the filtrate was treated with alcohol it was possible to precipitate quantitatively the active element. This precipitate gave all the tests for albumin. When dissolved in a physiologic salt solution, it affected hay-fever patients even in the very smallest quantities. In one

case 1-40,000 mg. was sufficient to cause a perceptible reaction. Normal persons can be treated with large quantities without reaction.

Through fractional treatment with ammonium sulphate, Kammann was able to show that the poisonous constituents of the pollen toxin was precipitated only after saturation and then in the form of albumin. The pollen globulin was found to be entirely devoid of action.

I will not deny that it was very difficult for me to be satisfied with the idea that the hay-fever poison was an albuminous body. It seemed too new and astonishing that a substance which was chemically characterized as albumin and to which most men were entirely indifferent could have such an intensely poisonous effect upon certain individuals.

So far I have not been able to find an analogy to this. Furthermore, I could not give up the idea that it must be a zymotic action. In the pollen, as has been mentioned, several kinds of enzymes had been found. By accident, however, I was able to show that a solution of pollen toxin could entirely lose its poisonous character without the different enzymes suffering in any way.

Our present knowledge does not permit us a deeper insight into the chemical nature of the hay-fever poison. We must content ourselves for the present with the establishment of the fact that the pollen toxin is a toxalbumin.

On heating to 56° C., the action of the pollen toxin was entirely unchanged. At 75° it loses $\frac{1}{4}$ of its power, at 100° , $\frac{1}{2}$. At 120° it is still active, but at 150° , as Prausnitz and Kammann have shown, it is completely destroyed.

These properties, especially the solubility of this toxalbumin, naturally render much easier the experimentation for determining its etiologic character.

At the beginning of my work, it was clear to me that nothing could be positively settled if it could not be shown that the substance to be regarded as the cause of hay-fever fulfilled the following postulates. It must be entirely inactive on normal people, but must be active on every hay-fever patient. According to the method of application, it must be possible to produce in the hay-fever patient, by means of the substance, one or all of the symptoms of hay-fever. Finally it must be possible to show that this action is entirely independent of the time of year or any other etiologic conditions.

So long as I worked with the pollen alone, all kinds of objection could be advanced against my experiments but these were removed by the dissolving of the toxin. Pollen, in addition, is much more difficult to free entirely from bacteria. The isolated toxin, however, can be made free from bacteria whenever necessary by heating or filtration.

The proof that the attacks of hay-fever in patient is produced by the pollen toxin throughout the entire year seemed necessary to me in as much as hay-fever is limited to certain periods of the year. Frequently, I have been met with the belief that in men, in the course of years, there has been established a cycle which can be compared with that observed in the higher plants which every spring come to life after their winter sleep. It was thought that in hay-fever patients the attacks occurred every spring out of purely internal causes without external causes at all. Now, since the pollen grains, as has been shown by experiments still to be described, enter into every room where the windows and door are not tightly closed, and are deposited everywhere, to be easily set in motion by every movement, it is very difficult for hay-fever patients to keep themselves from attacks of hay-fever in the spring. It was my duty, therefore, to show that a vernal evolution was entirely unnecessary and that the disease could be produced at any time of the year. Furthermore, as is well known, hay-fever does not appear in North America in the spring, but in the fall, so that a vernality in man was completely excluded there.

It has been suggested that pollen grains could not be the cause of hay-fever on account of their scant numbers in the atmosphere. By means of the toxin solution described, I was able, however, to show that one or a few grains of pollen contained enough toxin to produce intense symptoms in very sensitive patients. On the other hand, during the hay-fever season, that is during the period of the blooming of the grasses, a tremendous quantity of active pollen is found in the air. The number of pollen grains in the air can be determined after the method of Blackley. The latter showed that even in the middle of the City of London, an extraordinary number of pollen grains were to be found in the air in the spring. Liefmann found in Hamburg that the most pollen was to be found in the air when the hay-fever patients suffered most. He calculated that as many as 4,000,000 pollen grains within 24 hours fell upon a surface of 1 square meter. With such an amount of

pollen, many hay-fever patients could not exist if nature did not come to their help and wash away most of the pollen by means of the increased secretions of the mucous membranes, before the poisons were absorbed.

The observation that hay-fever patients feel better on rainy days and worse on warm, dry and windy days can be explained by Liefmann's suggestion, which has been confirmed by Prausnitz. The rain washes the pollen out of the air but at the same time causes a profuse formation of pollen in the flower, which is distributed through the air as soon as the rain has dried.

Before the significance of the pollen had been experimentally shown, hay-fever was etiologically one of the most complicated diseases. On the one hand, on account of the great role which the individual disposition played in these cases, and on the other hand, on account of the great irregularity which the attacks showed from day to day, which could not be understood, no explanations could be given of the meteorologic influences upon the origin and extension of the cause. Therefore, numerous hypotheses are found which depend upon the question of the etiology of hay-fever. At the present time, when we know the cause and are able to investigate it, many symptoms can be explained that formerly were entirely without explanation, and which gave the patient the right to change his views as to the cause of hay-fever repeatedly in one day.

For instance, if a hay-fever patient during the period of the disease goes out into the open air, he can for a certain space of time be entirely free from attacks. If however, there should be a cloud of dust which introduces the small irritating particles into the eye and on to the nasal mucous membrane, the latter begins to secrete. Now since pollen grains are there, the poison is dissolved out of them and made active by the tears or nasal discharges. It is no wonder that the patient, so long as he was ignorant of the importance and distribution of the pollen, said that the dust caused his attack. But then came the thought, why did not the dust cause similar attacks in winter? It was often said that bodily exertion coupled with intense heat produced these attacks. Now it is to be explained on the ground that the bodily exertion favors secretion and causes the solution of the poison which had formerly been deposited.

The attacks which begin in most patients in the morning on

dressing and usually shortly after washing, and of which many patients were disposed to consider contact with cold water as the cause, I explain in this way, that the movement or sudden excitation of the previously dry mucous membrane brings about a secretion. Since I paid attention to this point, I find it confirmed daily that contact with cold water causes a secretion of my nasal mucous membrane.

Frequently the secretion of the mucous membrane commences only when the patient, after being overheated, comes suddenly into a cool room. This may be seen in bicyclists. The patient concludes that the sudden cooling off had caused hay-fever, and he thinks that hay-fever is a special form of cold.

That under certain circumstances, penetrating odors, for example the smell of flowers, may cause the mucous membranes to secrete, I consider very probable.

Cats and horses play a great role in hay-fever literature. Many patients think that the smell of animals make them sick. I will return to this point later. I desire to state that one patient, who was confident that he became sick from the smell of a horse, reacted violently to pollen toxin.

Medical literature is rich in the discussion of the individual disposition of certain people for certain diseases. In infectious diseases we must, without doubt, consider the difference in the power of an individual to withstand the cause of disease. Experimental investigations of this question, however, in infectious diseases have drawn sharp limits. Hay-fever offers special advantages for such experiments, and it can be expected that in many ways explanations can be given of the circumstances causing the differences in individual predisposition.

I have stated that most people are in no way affected by the pollen toxin, while it is a very strong poison for hay-fever patients. The pollen toxin has been used not only in Germany and neighboring lands, especially England and Scotland, but also all over North America. Hay-fever patients everywhere react in a similar way to the smallest doses of the toxin, while normal people, many of whom were tested were unaffected. For this reason I have considered that I was correct in stating that the hay-fever appearing in Spring was a disease with a single cause.

In regard to the Autumn catarrh which is very prevalent

in North America, it was a priori to be expected that it was etiologically somewhat different. In North America, as is well known, the wheat industry is a very large one. The wheat blooms there at the same time as in Germany, without causing a disease in the hay-fever patient. Their disease does not appear before August. At this time, throughout the entire United States one could say, not only in every field, in every meadow and in every forest, but even in the largest cities, there blooms the ambrosia, which are commonly known as rag-weed; furthermore, there is a plant similar to this, one of the solidago family, the golden-rod. From the pollen of these two plants, I have isolated an albumin which is inactive towards our hay-fever patients, but active towards the American suffering from Fall catarrh. On the other hand, these do not react to the toxins of the grasses. During my trip to the United States last Fall, I used the rag-weed and golden-rod toxin in different places upon physicians who suffered from Fall catarrh and have always received confirmatory results. On the other hand, normal persons are absolutely unaffected by the toxins of these plants. The American Fall catarrh is therefore a disease with a single etiology.

There are persons who react to both toxins, the graminæ as well as the poison of the Fall catarrh. Such persons are also found in Germany. In North America such patients suffer from the beginning of May until October.

The observations which I have just described shows that pollen toxin is of great value for diagnostic purposes. I have repeatedly had patients brought to me as hay-fever patients who did not react to the toxin. Questioning in such cases revealed that the symptoms appeared not only in Spring, but at all times of the year. It is greatly to be desired that, in taking a history, more value should be placed upon the periodicity of the hay-fever. Furthermore, it must be remembered that pollen is deposited in our dwellings and working places and that even in the winter, by stirring up the dust, it can be made effective. In North America, golden-rod is frequently used in decorating the table. Furthermore, the pollen of asters and chrysanthemums, as I lately shown, contains a poison which is active towards those persons who suffer from Fall catarrh. Many attacks of hay-fever which break out at flower-bedecked banquet tables can thereby be explained.

I could report to you many single observations which would

be of interest to one or another of you, but my time does not permit me to go more into detail. I must rather turn to the experiments that were made to produce a specific antitoxin. One of two rabbits, into whose blood-vessels I had injected pollen grains, gave no trace of an antitoxin even after having been treated for a long time; on the other hand, in the serum of the second rabbit, there was found within a very short time so pronounced an antitoxin action that the possibilities of obtaining a specific therapeutic serum could be considered as established.

Further experiments confirm the above observation, whereby it is shown that even in animals, and even in members of the same race, there are found individuals who are absolutely indifferent to pollen toxin, and on the other hand, there are individuals for whom the same substance is an intense poison. The difference is greater however in the reaction of different kinds of animals.

I may not go further in regard to this point to-day, and will state only that among seven goats, I found only one which gave antitoxin, in spite of a thorough and long continued treatment with toxin. Of the horses tested, the majority were likewise entirely indifferent to the pollen. However, in the course of time, animals were found that reacted very strongly to comparatively small doses, which were much less than those which were absolutely without effect upon goats.

By continual employment of increasing amounts of toxin, it was possible to increase gradually the resistance of certain horses, and in the course of some months, the presence of a pollen antitoxin could be shown in their blood. The antitoxic action gradually advanced to a certain point, which is about the same in all horses so far tested.

If a solution of active toxin obtained from pollen is mixed with the blood serum of any normal animal, its action is not affected.

In such animals as are shown unresponsive to pollen toxin, it is also unchanged in spite of long continued injections of large quantities of toxin. Under certain circumstances, injections can be made for some months into those animals which react without the blood serum of the animal exercising the slightest neutralizing effect upon the pollen toxin. The blood serum of certain other animals, however, show, within a few weeks, a distinct, antitoxic action. If a solution of the

pollen toxin, which causes distinct irritation of the mucous membrane of a hay-fever patient, is mixed with such a serum the irritation is absent. It is possible, also, to counteract with such a serum the irritation caused by the pollen toxin. Experiments in this direction cannot be carried out upon animals, since their mucous membrane is not sufficiently sensitive to pollen toxin. The mucous membranes of hay-fever patients alone are suitable to that. Such experiments are not very annoying to them when the fundamental principles have once been established. Permanent injuries are not to be expected, since the artificial reaction lasts a much shorter time than those that are caused during the hay-fever period, and of these it is well known that they leave no bad effects behind, even after they have returned for decades, and that the patient is usually at once hale and hearty, as soon as the period when the grasses bloom has passed.

It occurred to me to try to neutralize the pollen toxin by means of cocaine, adrenalin and anesthesin and similar drugs, which have been used for years by hay-fever patients. Not the slightest neutralizing action could be obtained thereby. Furthermore, the amelioration which was obtained by such means in experimental hay-fever was very doubtful. The transient amelioration of the symptoms was quickly replaced by their increase; the headache was especially more intense.

The experiments to destroy or to render inactive the pollen toxin by means of different enzymes did not lead to results capable of therapeutic use. We obtained results in the formation of pollen antitoxin whenever the pollen was used subcutaneously or intravenously. Although large amounts of pollen were fed to animals, we never obtained the slightest amount of antitoxin from the blood serum of the animal tested.

The blood serum of the horse treated with pollen toxin is naturally not capable of therapeutic use as soon as the first signs of antitoxin formation is noted, but it comes into question only when it has reached a certain value. For prophylactic purposes, a serum of only the scantiest antitoxic contents is usually sufficient. To control irritation already present a larger amount of antitoxin is necessary. In a systematic prophylactic treatment, it is apparently possible to calculate according to the least patient and therefore the antitoxin is generally used in the practice in too great amount. In the

course of time, we have been able to produce a comparatively active antitoxin. Earlier, it was not possible to bring the standard of the serum, which I will explain in a few moments, over 20. Now however, it ranges between 30 and 40 in our best horses.

The estimation of the value of the blood serum was made in this way: A pollen toxin solution of permanent strength is mixed with various masses of serum to estimate the neutralizing strength of the latter. As the starting point of our estimation, we use an amount of poison which is just able to cause a severe, objectively visible irritation of the conjunctiva. That amount of antitoxin which exactly neutralizes this amount of poison we have called antitoxin unity. A serum of which one c. cm. exactly neutralizes one c. cm. of our toxic solution we have called the unit (*einwertig*). This toxic solution is so chosen that one drop of it, $1/30$ of a c. cm., causes distinct irritation of the conjunctiva of a certain hay-fever patient. If 1 c. cm. of an antitoxic blood serum neutralizes 1 c. cm. of this toxic solution, it is univalent; if $1/2$ c. cm. of serum neutralizes 1 c. cm. of toxic solution, the serum is two-fold (*zweiwertig*), if $1/20$ of a c. cm. of this serum neutralizes 1 c. cm. of the toxic solution the serum is twenty-fold (*20 wertig*), etc.

Such tests have been made hundreds of times, and it has been shown that the results so obtained, even in those patients whose sensitiveness is very different, still lead to coinciding results, when the concentration of the poisonous action has been carefully chosen.

Theoretically the possibility of such an agreement in the estimation of the value seems very doubtful for the following reasons:

From the description given by Dr. Prausnitz lately, in the *Berlin.klin.Wochenschrift*, of the experiments made in regard to this subject, it may be deduced that neutral mixtures of toxin and antitoxin cannot be obtained if the antitoxic amount is increased in the same proportion as the toxin, but that a doubling of the amount of toxin under certain circumstances can demand a multiplication of the amount of antitoxin.

Now, it can be shown that different hay-fever patients show a very different susceptibility to the pollen toxin, that for example patient A. reacts to an amount of toxin $1/20$ the amount required for patient B. If patient A. tests an antitoxin by the

use of a poisonous dose $1/20$ the *dosis minima efficax* for B., it is possible to find a serum more than a 100-fold though it was the unit dose for B. If the test however, was made by using the *dosis minima efficax* for B., the results in the cases of A. and B. coincide completely. Under certain circumstances, A. will still show a certain reaction, since twitching will appear in the affected eye, although there will be no injection of the conjunctiva. This will show that in the mixture there was less than $1/40,000$ of a mgr. of free toxin (ie. less than that dose which causes in A. an injection of the conjunctival vessels objectively visible).

By means of experiments carried out for many years by Dr. Prausnitz and myself, we have reached the conclusion that the certainty of the estimation of the value, whether obtained by immunizing or in other ways, does not gradually suffer. On the contrary, we were able to show that repeated estimate of the value of the same serum, after the lapse of years, gave the same results.

That we were able to test the antitoxic value before each removal of blood from a horse, exerts a control important for practice, as is seen from the favorable results obtained in our practice, to which I well refer again later.

I would like to note, at this place, an interesting observation which we made during our testing. The patients, as far as our tests have gone, seem invariably to react to the subcutaneous injection of normal horse blood by local swelling, redness and heat at the point of injection. When normal horse serum is dropped upon the conjunctiva of hay-fever patients, no reaction follows. The same was the case on the application of dried serum. Not one of the hundreds of hay-fever patients, whom we have tested, reacted to the blood serum of the horses that were treated with pollen toxin. It is true that during the hay-fever period, irritation has been repeatedly ascribed to the antitoxin. A closer observation showed in every case except one, which I will discuss presently, that they were patients where the necessary control was lacking and who now ascribe to the antitoxin the same symptoms which they for years have suffered, and which they had heretofore called hay-fever.

The fact must be noted, however, that patients whose conjunctivae have been treated with pollen toxin occasionally react to applications of antitoxin by an increase in the irritative

symptoms. This was frequently to be explained by the fact that the tears or mucus secreted dissolved and made active the toxin that was already present, but undissolved, before the antitoxin could attack it. It cannot yet be settled whether or not this explanation is sufficient in all cases, nevertheless this transient irritation which may cause several severe attacks of sneezing is followed within a very short time, at the most 10 or 15 minutes, by a complete disappearance of the irritation, which in turn is followed by a period of immunity against the toxin lasting an hour or longer as happens under normal conditions.

Only in one case were we convinced that even outside of the period of hay-fever, i. e. when pollen toxin was not present on the conjunctiva, in consequence of the application of the serum of a horse which had been treated with pollen toxin, there appeared an intense injection of the conjunctiva. The same symptoms, however, appeared when normal horse serum was applied, nor was it absent when heated normal serum was used. This patient, therefore, showed a very pronounced idiosyncrasy against normal horse serum. Here, I might mention that the literature is rich in cases, according to which, certain persons could not endure the presence of cats and horses. Even if a cat was concealed in some corner of the room, the patient would commence to sneeze on entering the room. As everyone knows, such stories are usually exaggerated. But whenever a patient takes a cat on his lap, he must remember that this cat had probably been rolling around in hay, and that in this way, pollen grains may have become deposited in its fur and can be dusted out by stroking the animal, and are breathed in by the patient.

The same is true of horses, that usually every day, for hours at a time, pull down hay from mangers which are high above them, in which way the pollen contained in them has had abundant opportunity to become dusted out and caught up in the hair of the animal. Whoever, then, strokes the horse, rides him or travels after him is in danger of now and then breathing in grains of pollen, which are freed by the movements of the animal. I will not, however, deny that there are people who have attacks of asthma when they smell horses. This idiosyncrasy however, does not necessarily have anything in common with the idiosyncrasy shown by certain patients towards horse serum.

A short time ago, such a patient declared to us that he could not stand the smell of a horse, that he was not a hay-fever patient, and that he worked with horses during the year. Testing this patient showed that he was very sensitive to pollen toxin, and that the symptoms caused thereby were promptly counteracted by antitoxin. He was simply a hay-fever patient who did not call himself such, but had another explanation for his disease. This was of unusual interest to me, because I had theoretically assumed such cases as the one described.

Furthermore, in preparing the pollen antitoxin we made the following not unimportant observation: In the blood serum of certain horses, the antitoxin appeared in the usual way in such an amount that the blood serum neutralized large quantities of pollen toxin. In spite of the high concentration of the antitoxin, the serum itself showed an irritative action found only in hay-fever patients but not in normal people. Some substance acting specifically on hay fever patients must therefore be produced by the pollen treatment, which can not be the pollen toxin. Otherwise, it would have been neutralized by the excess of the antitoxin.

To return to the production of the antitoxin and its therapy, which certainly interest many of you very much, I can state to you that the well know firm of Schimmel & Co., in Miltitz, near Leipzig, are prepared to furnish the antitoxin and have relieved me of a lot of work which in the beginning was necessary. They call the substance Pollantin.

Schimmel & Co., have in their manufactory in Miltitz a stable for the purpose of making the Pollantin which is under the constant control of the veterinary department of the University of Leipzig. The injections and the removal of blood are done exclusively under veterinary regulations. The greatest care is taken that the blood shall be from entirely healthy animals. The serum is examined in regard to its concentration and its bacterial contents. The removal of blood takes place only with my approval of each case. In this way the production of antitoxin of constant value is assured.

Subcutaneous use of the antitoxin seems excluded on account of the above mentioned idiosyncracies of many, perhaps of all hay-fever patients towards normal horse serum. Since it has been shown that the antitoxin is completely bound to

the globulin, experiments are being made leading to the production of a serum suitable to subcutaneous injection.

I do not consider it absolutely necessary to have such a serum. I consider that it is rather a great advantage of the antitoxin that success is obtained without recourse to injection.

Hay-fever is distinguished from those diseases, in which for a long time specific antitoxins have been used, by this fact, among others, that the infection takes place not only once, causing a development in the body of the infectious matter, but that for many weeks the poison continually attacks the patient. A subcutaneous treatment would be very desirable in such cases if it were possible thereby to make the patient non-sensitive to the toxin for a long time, say for one or two weeks. This seems, however, in the light of our present knowledge, to be impossible. I have been compelled to give up active immunizing of hay-fever patients as not suitable for practice.

Under such circumstances, a method of application must be found which is possible for every patient at all times. It was therefore a pleasant surprise to me to find that the simple application of a drop of serum to the conjunctival sac or the nares was entirely sufficient to make these ports of entry for the poison completely insensible and even to counteract symptoms that had already appeared. Personally, in view of this fact, I have no desire for any other method, for a simpler method of application could not be found. There are, however, patients and physicians who, for some reason or other unknown to me, desire a subcutaneous use of the Pollantin. I will admit that in cases of severe asthma or bronchitis, as are observed in the American form of the disease, or in cases where the nares are entirely occluded for air, the question arises whether or not a subcutaneous use of the remedy would be able to relieve these bad conditions. It has been shown, however, that in most cases where the nares are entirely occluded, results can be obtained by repeated application of the Pollantin to the conjunctiva. The action takes place on the nasal mucous membrane via the tear ducts. If, in addition, tampons of cotton impregnated with antitoxin are introduced into the nares most affected, in the course of about half an hour this becomes completely freed, and the cure can be carried out on the other side. Furthermore, it seems very advantageous on the worst days to alternately bring the mucous membrane of the nares

to rest and treat it prophylactically. This is done by alternately closing the nares with a pledget of cotton after the use of the antitoxin.

After it had been shown that Pollantin was suitable only for external treatment, there appeared practically the objection, that it was difficult to prevent the tears or mucus coming in contact with the remedy and infecting this with bacteria. We tried to prevent the decomposition of the serum by using a disinfectant. It was found, however, that with the exception of carbolic acid no other remedy could be considered, and that this in itself caused irritation in the concentration which was not always sufficient to protect the antitoxin, during use, for longer than a few days. The futility of all experiments led me to dry and pulverize the serum. In this form it cannot be decomposed by bacteria. It can be brought by means of a small spatula or brush into the mucous membrane, for months, out of one and the same package without the slightest signs of decomposition of the remedy.

It was found, however, that this powder when used alone exerted a mechanical irritation upon the mucous membrane. It had to be diluted with a soluble, sterilizable, neutral substance. After many tests, I chose sugar of milk as the most suitable, because it excited the secretion of the mucous membrane and caused the antitoxin to pass into the solution more quickly.

I have already stated that it seemed impossible to bring the antitoxic contents of the horses' serum above a certain height, even after years of treatment. Still the strength already obtained is considerable and a few drops of the serum contains enough antitoxin to neutralize the entire amount of poison which affects us during the hay-fever time in the course of one day. It has actually been shown, also, that many patients, who have used the antitoxin in strict compliance with the directions, have used during the entire hay-fever season at the most not more than three grams of the pulverized remedy, and have kept themselves entirely free from attacks. Personally, I use only the powder, and recommend this because numerous patients cannot stand the carbolic contents necessary for the fluid preparation. Some physicians as well as many patients have accustomed themselves to the fluid preparation and desire it. For this reason the manufacturers prepare it.

Naturally, it was very difficult to make hay-fever patients

believe in a single treatment of their disease, when almost every one was an intelligent person, and each one had his own theory in regard to his disease.

Almost every hay-fever patient believes that he should have as much fresh air as possible. I can understand this very well and must admit that as long as I was ignorant of the etiology of hay-fever, I kept the window open at night during the hay-fever time, because the disease, although not a direct dyspnea, gave the feeling that necessary fresh air was wanting, but as soon as the patient is so situated that he either does not come in contact with the pollen toxin or neutralizes this immediately, this symptom disappears. It is therefore an expression of the intoxication. The most difficult task seems to me to compel the hay-fever patient, during the period of the disease, to keep his doors and windows closed at night. There are indeed patients who, on account of correct use of antitoxin remain free from attacks throughout the night, even when their windows are left open; these patients, however, are in the minority, and there are at least many patients in whom the transient immunity does not last so long. During the night, i. e., during sleep, the patient is less sensitive to the poison. He is most sensitive, as I could prove in periods other than the hay-fever season, when he awakes in the morning. The entire action of the poison assimilated during the night comes on awakening, i. e., takes place at the most sensitive time of the day, and it is not always possible to counteract immediately and completely the severe attack that follows, by means of the Pollantin.

It has therefore been recommended, in the directions given with the Pollantin, to use it in the morning upon awakening and while in bed. The attacks come as soon as the patient begins to move. Upon washing with cold water, as already noted, the secretory power of the mucous membrane is excited; the poison is thereby dissolved and, as most patients have observed upon themselves, the attacks are usually most severe. If the antitoxin is applied while the patient is still in bed, the attacks are sometimes completely avoided. This does not always happen. Sometimes it will seem to the patient that the attack is caused by the antitoxin. It is a fact that secretion and, simultaneously, the solution of the poison already in the nares is caused by the Pollantin, and is most probable that the action of the poison upon the mucous membrane is

the more rapid. If the patient under such circumstances, does not lose courage, but uses the antitoxin, if necessary, two or three times within a half hour, it will be possible almost without exception to check the attack and bring about a condition of insensibility towards the poison for several hours at least.

Every hay-fever patient should study himself in this respect. I believe that it is not well for all patients to use the remedy upon arising, but that it is better if they make the application at the time when they are going out into the open air. For many patients it has been found best for them to use the remedy in the evening just before going to bed; others find it better however, to use the Pollantin at least one to two hours before going to sleep, in order that it may be completely dissolved and absorbed before the eyes are closed.

The greatest mistake that can be made is to use the remedy in too large doses. I have had a number of patients who say that they have used in one or two days as much Pollantin as would last the entire season by careful use. These were the patients who were dissatisfied with the action, and I consider that the reason for this is very clear. Our conjunctiva is not adapted to be carelessly filled with powders as happens in many cases, e. g., that of Wolff (1) who placed 1/15 of a gr. of Pollantin in the eyes of his patients and then noticed an irritation.

I would consider this as self-understood. I am accustomed to tell my patients to dip the brush in the Pollantin powder and to touch the external superior border of the lower lid with the brush in such a way that a white point is visible on the lid. If the eye is opened and shut once or twice it can be seen that the powder is moistened by this movement and carried into the conjunctival sac. Under such circumstances scarcely the slightest mechanical irritation will be caused by the use of the Pollantin, and the amount of Pollantin thus used is sufficient to neutralize the comparatively small amount of poison which has come into the eye.

To make the use of Pollantin powder in the nose easier, small aluminum spatules are fastened in the corks of the glasses. An amount of powder more than the size of a lentil should never be used. I have seen patients who applied 20

(1). A. Wolff-Beiträge zur klin. Med. (*Festschrift für Senator*) 1904. Wolff's article is used as an advertisement for Graminon, a product which irritates hay-fever patients very much and does not contain antitoxin.

to 30 times the amount, and placed the spatule completely filled with Pollantin in the nose. This must naturally irritate the mucous membrane which is already sensitive on account of the toxin.

Dr. Goldstein, of St. Louis, has made an instrument by means of which the patient can blow the Pollantin into his own nose and distribute it without being compelled to snuff it up. I have used Goldstein's apparatus with good results, and have recommended to Schimmel & Co. to have it for sale at drug stores, in connection with the Pollantin.

It is not necessary for me to go further into the method of use. The directions accompanying the medicine must be changed yearly on account of the progress in our knowledge. I have observed an unpleasant feature in the United States of America. Certain physicians handle the Pollantin themselves and give it to the patient at very high prices, after they have very carefully removed the directions and everything which the patient could use in treating themselves. If these physicians had taken the trouble to read the directions carefully, and to acquaint the patients with the chief points therein, we could have passed over this circumstance as a necessary evil. I consider it very reprehensible that the patients were left without any instructions at all, and therefore could not use the remedy rationally.

We have, as has been said, to do with a remedy which differs from most other remedies in that it is not used, bought and taken at specified periods, but which demands intelligence and a certain amount of skill on the part of the patient. In consideration of these facts I had counted *a priori* on no very favorable reception. I was astonished by the very satisfactory reports of the patients who wrote to me.

Dr. Luebbert has tabulated our correspondence and finds that out of 505 patients, 299 (59.20 per cent) had used Pollantin with absolutely favorable results, i. e., had remained without an attack during the entire period. 145 (38.30 per cent) used Pollantin with partial results. 63 (12.50 per cent) without results.

It is a matter of experience that we hear sooner from the dissatisfied than from the satisfied. That this old experience has happened in the case of Pollantin is shown by the fact that I very frequently hear wonderful results, which are called to my attention, accidentally, in social intercourse or otherwise.

Although our statistics embrace only about 500 cases the remedy has been used by thousands of people, and I do not doubt that the statistics of Luebbert will be more favorable when the communications as to the results are more complete. In order to contribute to this, Schimmel & Co., have determined to include with the Pollantin this year a blank for scientific purposes. I insist that in the work which will be based upon it, no names under any circumstances, will be mentioned. In those cases where reference to occupation, etc., seems desirable, we are always accustomed to obtain the consent of the patient.

It is furthermore very difficult to obtain true complete results as to the practical value of the remedy. There are patients who continually write and complain that they do not succeed with the remedy. If one finally loses patience and advises them to cease using the remedy, they will write that they were misunderstood, and are unable to live without the remedy, only they cannot keep themselves from occasionally sneezing. They thought they were obliged to let me know that. Still, I think that Luebbert has settled so well the difficult task of critically working over our correspondence, that the statistics published by him are of durable value. He classed as complete results, only those cases where the remedy was used during the entire hay-fever period, and the patients during the entire time remained free from the disease.

chiefly the pollen of grasses. These, especially those of rye

In speaking of the etiology of hay-fever, I have mentioned and wheat, are practically the chief cause of hay-fever in Germany, although specific pollen toxin has been found in certain other plants, for example, lily-of-the-valley. The same is true for all European states. In India the rice bloom has the same effect as the rye bloom here. It has been shown that as far as Australia, hay-fever in toto is an etiologic unity agreeing with European hay-fever. An exception is found only in the United States and Canada. Here the European hay-fever is also found, but it is designated in addition to hay-fever as Rose-cold, June-cold, Peach-cold, etc. In all these cases the affection seems to be the European hay-fever. In these countries there appears later, in the first days of August, an affection that agrees clinically almost completely with hay-fever. In many cases the patients are the same as those who suffered in the Spring. The vast majority are other persons. It is a priori certain that the pollen grains of the graminæ cannot be the

cause, but, if it is pollen grains at all, it must be of those plants which bloom in August until the beginning of frost. Such plants are found there in such wide distribution that they can almost be called the national flower, as has happened here and there. As was mentioned before, these are the golden-rod and the rag-weed whose flowers cover every meadow, field and forest of the northern states and far into the western with a golden yellow color in the Fall.

To better test whether the American Summer catarrh was caused by these plants, I tried to obtain specimens of their flowers in Germany. It happened that the Botanical Garden in Hamburg had planted these two plants. The solidago bloomed but the ambrosia did not. Through the kindness of Prof. Voigt, however, I obtained a flower of the latter which had been plucked two years before and preserved in a herb-arium. From these flowers I could obtain enough pollen to prove that in those persons suffering with American Fall catarrh, the characteristic hay-fever symptoms were produced by the pollen grains of the rag-weed. Some European hay-fever patients were unaffected by the toxin of the rag-weed and the golden-rod, while others, as for example myself, reacted to them. I think I may conclude from this that the persons suffering in the Fall in America are affected by hay-fever.

Many years ago, during a residence of several years in America, I never experienced the symptoms. I am therefore confronted by the question whether in the meantime a tendency to this disease has developed in me. When last fall I made a trip, about the middle of August, to America and the steamer was still 500 English miles from the land, the first symptoms of Fall catarrh appeared increasing in the proportion as we neared land. On my arrival I learned that the disease had just broken out everywhere.

In the meantime, I have had abundant opportunity to show that the pollen grains of both the rag-weed and the golden-rod contain an albuminous substance which affects persons suffering with American Fall catarrh, but does not affect other persons. Against my statement that Fall catarrh was caused by golden-rod pollen, numerous American colleagues who suffer from hay-fever presented most varied opposing arguments. They claim that they could walk through places where the golden-rod was blooming, pluck the flowers and shake them in front of their eyes and nose without being affected. In all

such cases I could at once remove this opposition when I applied toxin which I had brought with me made out of golden-rod pollen and with it caused hay-fever symptoms. These colleagues may be right in claiming that the golden-rod has practically less significance than the rag-weed, for it does not shed its pollen so easily. At least this seemed to be the case for certain kinds.

Furthermore the toxin of the golden-rod seems to me to be almost completely if not entirely identical with that of the rag-weed. I conclude from this that the toxin and the antitoxin will influence each other.

In the year 1904 after I passed through the entire hay-fever season in Hamburg, it was my fortune to come to Scotland just when the hay-fever had broken out there. By means of the Pollantin I was able to protect myself from attacks, even during the railroad journey. Most interesting was a third campaign in the United States. Thither I had taken an antitoxin obtained by means of the solidago pollen. I put off its use until the symptoms of Fall catarrh had developed intensely, producing a very severe bronchitis, because I wished to convince myself completely as to whether my susceptibility to the poison, which I had found by experiments was confirmed by practice. After this question had been settled in the affirmative, I began to use the antitoxin with such good results that I could ride thousands of miles without suffering in the least.

On this ground I am convinced that the fundamental laws have been laid down for the explanation and treatment of the American Fall catarrh.

In America, I saw truly pitiful results of Fall catarrh; men who, so to say, could neither live nor die. I was very much interested by the difference in the results obtained by the American physicians. Some of them devoted themselves to the study of Pollatin with a true enthusiasm, and they had had wonderful results as I could convince myself. Others had less favorable results. In all of the latter cases, however, it was not difficult to show that the method of using had not been correct. The chief cause of the failure was a too abundant use of the remedy.

On many occasions I was compelled to tell about my hay-fever studies, and I met with extensive discussions and thousands of doubts. These vanished the moment that I could use the necessary toxin and antitoxin, and the physicians suffering

with hay-fever who were always present in large numbers were ready for a demonstration upon themselves. Now when half a dozen physicians, and especially those who were my most violent opponents, had been treated with a drop of toxin, and the hay-fever symptoms had very promptly appeared, and when a similar number of normal physicians had remained unaffected, and when the severe irritation had disappeared in a few moments under the influence of the antitoxin, the effect was complete and every one who suggested dogs, cats, artificial flowers and autosuggestion were laughed to scorn.

How does it come then, that people who have always lived in Europe where golden-rod and rag-weed are never found and who therefore have never been affected by their specific toxin are sensitive to this poison which as far as our knowledge reaches is present only in these plants and perhaps no where else in the world?

So long as the proof of such conditions was not found, it was natural to think that the disease was to be considered the expression of an acquired or inherited supersensitiveness for which contact with the poison was responsible. Such an explanation must be given up, the more so when it is remembered that hay-fever frequently, if not usually, appears as a sequel of influenza. The lasting lesions which are caused by influenza have certainly no etiologic relation to the albuminous constituents of the pollen of grasses.

I have already made the attempt to sketch the different possibilities which present themselves on the ground of Ehrlich's experiments and theories.

I will not enter into this point to-day, but will only mention certain questions with which I have busied myself during the course of the last year.

Wherein lies the reason that of two apparently normal men, one reacts most violently to the constituents of certain pollen grains while the other is entirely unaffected by the same? It might be thought that in the bodily fluids of the hay-fever patient, the pollen substance is so changed that it is developed into a poison, either by a fermentative or degenerative process. This explanation is disproved by the fact that pollen toxin after treatment with the serum of hay-fever patients is inactive towards normal persons.

Furthermore, one could think that the normal person possesses a natural antidote which is lacking in the hay-fever

patient; such an explanation has already been made as I have found in the literature. It is disproved however, by the fact that the pollen toxin, after treatment or even after being dissolved in the blood serum of normal men or animals has its activity entirely unchanged.

The cells of the mucous membrane of the patient react to contact with pollen toxin with increased secretion. Simultaneously all the vessels of the affected mucous membrane dilate. This could be due, either to an irritability of the cells or of the nerve endings. The last question does not seem easily capable of solution by experimental means. The question as to the specific irritability of the cells I have been able to approach in several ways with results that were astonishing in many ways.

Although, with the assistance of Dr. Kammann, I have made numerous valuable experiments for two years, and although we have frequently observed the workings of the pollen toxin on the cells of the patients in a manner that can be described as specific, I must admit that the experiments are not absolutely satisfactory. Until this is the case, we do not desire to publish our findings.

We hope, however, that we shall be able, in a very short time, to demonstrate the individual predisposition of hay-fever patients to pollen toxin and the relation of hay-fever to influenza by means of simple experiments that can be carried out in the test tube.

XX.

THE SERUM TREATMENT OF HAY-FEVER.

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Until Dunbar¹ introduced his serum treatment of hay-fever, the remedies which had been used, had attained so considerable a number that it was obvious that the specific had not been found. Thus Sticker² mentions the following:

Quinin, iron, arsenic, salicylic acid, sulphur dioxide and carbonic acid, salt solution, glycerine, boric acid solution, sodium phosphate (1-500), carbolic acid (1-100), bichlorid of mercury (1-5000), hydriodic acid, peroxide of hydrogen, sulphuric acid, ammonium carbonate, chloroform, eucalyptol, chromic acid (1-100), lactic acid (20-100, 50-100), glacial acetic acid, zinc sulphate, zinc chlorid, silver nitrate, camphor, menthol, laudanum, canabis indica, morphin hydrochlorate and sulphate, atropin sulphate, cocain hydrochlorate, bismuth subnitrate, bismuth carbonate, capsicum, ipecac, all ordinary snuffs.

Although the disease had been subject to considerable study, especially during the last 30 or 40 years, very little had been determined in connection with its etiology except that the pollen of certain plants seemed to be instrumental in its production. To this were added a special predisposition on the part of the patient and an abnormal condition of the nose, which were accounted sufficient by teachers and text-book writers. The role of bacteria had been announced by Helmholtz³, supported by Weil⁴, Axillos⁵ and others and disputed by Thost⁶, Heymann and Matzuschita⁷ and others who made extensive experiments. Blackley⁸ who was the greatest exponent of the pollen theory enunciated by Elliotson⁹, made an extensive study of the relation of pollen to hay-fever and determined

the number of pollen grains per cubic foot under various conditions.

It was Dunbar, however, who was the first to apply modern methods to the study of hay-fever, with tangible results. Differing from others who were content to examine the pollen in the atmosphere, he conceived the plan of subjecting predisposed individuals to the action of pollen grains during the quiescent stages of the disease. His experiments are at present well known. How he determined that the pollen grains would thus excite paroxysms in the predisposed, while the controls were unaffected. How, by classical and logical steps of the investigation the artificial hay-fever was produced by the administration first, of pollen of certain plants, second, of filtered solutions of this pollen in tears, nasal secretions, blood serum, saliva, etc. How the absolute non-toxicity of the pollen or of the solution of its active agents for non-predisposed individuals was established. Finally how a very violent reaction follows a subcutaneous injection of pollen toxin in predisposed individuals, while none occurs in controls.

Dunbar's further work in developing an antitoxin was an important event in therapeutic research consequent upon his investigations; its value in artificial hay-fever was easily established.

These experiments which have been accepted by various observers have been confirmed and extended, especially in the Hygienic Institute at Hamburg, under Dunbar's directions. Kammann¹⁰ determined that the poison was a toxalbumin which was thermostabile, antagonistic to alkalies and not completely destroyed by enzymes like pepsin and trypsin. Liefmann¹¹ concludes the report of his observations with the following:

1. The occurrence of hay-fever and the presence of pollen in the air are two simultaneous congruous observations, insofar as the beginning and end fall together.

2. The factors which influence the number of pollen grains in the atmosphere follow the clinical picture, so that the curve showing the pollen count in the air agrees with the general course of the disease.

3. The heretofore unsettled question as to whether the quantity of pollen grains in the atmosphere is sufficient to cause the symptoms of hay-fever may be answered in the affirmative.

Lübbert¹² publishes a list of plants whose pollen toxicity and nontoxicity for hay-fever has been established.

The pollen of the following plants* has been found nontoxic: Common lilac, common iris, crocus, English plantain, common plantain, scabious, bitter-sweet, deadly night-shade, wild tobacco, black mullein, bindweed, pansy, blue-bell, woolly mullein, cow parsnip, coriander, common carrot, spotted hemlock, elder, common flax, lily, tulip, narcissus, hyacinth, squil, wood rush, dock, sorrel dock, heath, maple, English cherry, mock orange, Japanese quince, English meadow sweet, water avens, rose (7 different varieties), dog rose, bramble, corn poppy, linden, oriental poppy, common poppy, peony, monkshood, European globe flower, buttercup, pasque flower, anemone, purple foxglove, rock cress, wild geranium, meadow geranium, high mallow, wild mallow, sharp leaf mallow, hollyhock, marshmallow, laburnum, St. John's wort, burdock, common dandelion, mountain arnica, wild chamomile, milfoil, common wormwood, sunflower, garden marigold, spurge, Scotch pine, mountain pine, common nettle, alder, American white birch, English oak, willow, European yew, club moss.

The pollen of the following plants has been found toxic: Rye, cultivated oats, barley, oat grass, rice, reed, mountain reed, Haller's reed, orchard grass, blue grass, cotton grass, dog's tail grass, reed canary grass, ray grass, velvet grass, meadow foxtail, turfy hair grass, quick grass, meadow fescus, grand fescus, wheat, soft chess, common European honeysuckle, lily of the valley, Solomon's seal, common evening primrose, mustard, thistle, ox-eye daisy, golden-rod, (3 varieties), corn flower, chrysanthemum, aster, Indian corn (maize), sedge (7 varieties), white orach, great ragweed, bitter weed or hog-weed, ambrosia (ragweed, 2 varieties), burweed, ivy, common spinach.

Having established the value of antitoxic serum in experimental hay-fever, the remedy was exhibited during a portion of 1903 and the whole of last year in cases of hay-fever all over the world. In the main, good results have been reported, far better than from any other remedy previously administered. The results were particularly good when it is consid-

*The botanical classification used by Lübbert is not current in this country. As far as possible the common names were determined from the botanical names which he gives; in other cases the German names have been translated.

ered that it was used helter-skelter by all sorts of physicians as well as patients without reference to the associated conditions. Doubtless many, among whom I must include myself, used the remedy for cases which were not hay-fever, but which presented symptoms, appearing during the hay-fever season, which simulated those of the disease. What a variety, then, of different conditions conglomerated under the lay term, hay-fever, must have been subjected to the serum treatment? How important, therefore, was it that the therapeutic side of the question should be weighed carefully in the light of accurate clinical observation and test.

Reports confirmatory of the claims made by Dunbar have been made by Glegg¹³, Mayer¹⁴, MacCoy¹⁵, Somers¹⁶, Prausnitz¹⁷ and Stein¹⁸.

Somers arrives at the following conclusions after a considerable experience:

1. The serum produces prompt and positive amelioration of the symptoms of fall hay-fever in the majority of cases.
2. In a smaller number this favorable result is soon accompanied with complete disappearance of the affection.
3. Where slight or no action is seen after its use, pollen as an etiologic factor does not predominate.
4. When results are obtained, it favorably influences all the manifestations of hay-fever.
5. When given during the attack, irrespective of its severity, it produces marked palliation rather than absolute cure.
6. Its effect on future attacks remains as yet unknown.
7. Serum in powdered form is slightly soothing to the nasal mucosa, has but little effect on the other symptoms of the affection and in occasional cases it may act as a direct irritant.
8. As a result of larger experience, especially with hay-fever occurring at other times of the year, it may become necessary to modify some of the opinions in regard to this antitoxin.

Sir Felix Semon¹⁹, who is universally known as one of the most conservative as well as observing of laryngologists, from personal investigation of eight cases, admits that the serum treatment gave relief in some and appeared to have acted beneficially certainly in postponing the occurrence of the attack in others, and that these results might possibly have been more marked if the applications had been made with more frequency. Two of his patients stated that the hay-fever period had been made more tolerable than on previous occasions.

But one paper has appeared which in a marked way contradicts either the findings or the claims of Dunbar. Fink²⁰ presents objections which are rather polemic than convincing. He argues against Dunbar's theory of pollen toxin by showing that cases of hay-fever occur when but few or no pollen grains are found in the air, when the grasses are not flowering. He is encouraged in his view by the fact that the toxin had acted (as quoted by Sir Felix Semon in one case) where no hay-fever had previously been present. He also lays great stress upon the fact that Möhr²¹ succeeded in preventing hay-fever during a railroad journey by means of an apparatus which prevented the pollen from passing into the nose. According to Fink, this disproves the theory because the patient failed to acquire the usual paroxysms through the agency of the conjunctiva. He reports three cases in which the use of the serum was without good result; in one case the artificially produced hay-fever had been relieved by the antitoxin—a living example, he thinks, of the false results of laboratory research when subjected to clinical experience! All of which seems very similar to what was presented in opposition to the diphtheria antitoxin.

Following this, Fink discourses favorably upon the theory that the disease is a manifestation of neurasthenia, admitting that various patients have an idiosyncrasy for certain plants! He believes that the *casus morbi* of the disease is the antrum of Highmore and that the ocular and other remote symptoms are of a reflex character. Finally he finds in aristol the remedy which when applied to the mucosa of the antrum cures all forms of coryza and hay-fever. Perhaps the same rigid scrutiny manifested in opposing Dunbar's theory and results would be followed by as positive objections to his own conclusions as he found to Dunbar's.

My own experiments began in the summer of 1903 with some toxin sent to me by Prof. Dunbar. Several tests were made to ascertain whether or not there would be any reaction. But one of the cases remained sufficiently long under observation to fulfill all the conditions of the test. This case will be reported more at length. Another that of a young medical student, who had been in bad health, was treated in the following way: For five successive days a simple salt solution was dropped into his nose as well as into my own. On the sixth day the toxin was used resulting in violent reaction in

his case, while there was none in mine. The following day the toxin was again injected with the same result. In this way the element of suggestion was entirely eliminated for the patient did not know but that the toxin was used from the very first day.

Cases will not be reported here in detail particularly as the list subjected to this treatment has now become very large. One thing was manifest early in these studies, viz.: that there were other features to be considered besides the paroxysms—that there were other things that required treatment. It is not to be supposed that an exciting cause affecting the blood vessels so positively would fail to call into action certain other agencies which would continue even after the paroxysms themselves would cease or which would most decidedly influence them. Moreover, it must be admitted that the nasal mucosa of hay-fever patients is subject to the various affections which attack it during the intervals of the paroxysms. On the other hand, there are often found conditions of the nose which occasion no marked symptoms during the quiescent stage, but which makes their presence felt at the period of the attacks. Then again there are circumstances which modify the application of the remedy or prevent its good effect. A large spur or a narrow or irregular nasal orifice may interfere with its application especially when used by careless hands. Besides this, it is just possible that the state of the mucosa or of the secretion may have much to do with the taking up of the agent. Many patients think that they may act with impunity in view of the fact that they have a specific at hand. Finding that it is not equal to the unfavorable circumstances to which the patient subjects himself, it is discarded. Again and again has it been observed that the serum proved to be efficient under proper administration when it had been thought to be useless. As with every other therapeutic agent, it must be used with intelligence and with due consideration of the attendant conditions.

The following grouping is clinically made: .

1. Typical cases of rose-fever, or German hay-fever.

These cases do better than any other variety, probably because the serum heretofore used has been prepared by immunization with toxin from the pollen of rye and other gramina. In every case there was relief after a few days from the symp-

toms of itching of the eyes, nose and palate, sneezing and nasal obstruction.

In one case, that of Mrs. K., the disease had continued almost uninterruptedly since May, 1902, with the superaddition of asthma which first appeared in October, 1902. As this was the first patient treated (in August, 1903), but little promise of relief was given. After a very few days, however, all the symptoms disappeared with the exception of the nasal obstruction. This was found dependent upon a chronic hypertrophic rhinitis in which both inferior turbinates were involved. She still has mild attacks from time to time which come on with an acute coryza. Symptoms of hay-fever appear; under appropriate treatment the symptoms disappear within 24 to 48 hours, with the exception of the obstruction. A portion of the left inferior turbinate has been removed and when these attacks now come on there is only a moderate amount of obstruction on this side. In this case the use of the pollen toxin was followed by a positive reaction.

Another patient, Mrs. L. A., was suffering intensely when she presented herself, August 2, 1904. She stated that since May she had been suffering almost constantly with colds, sneezing, itching of the eyes, etc., and had had no relief from treatment whatever. Within two days after the administration of the serum all the active symptoms disappeared and she insisted on having the nose freed from obstruction. Accordingly the necessary operations were performed, despite the fact that she had been suffering from the paroxysms but a few days before. She has had no recurrence.

H. S. had suffered from rose-fever for many years with sneezing, itching of the nose, eyes and throat during the paroxysms and sneezing at all times during the year. Entire relief from the sneezing and itching speedily followed the administration and the sense of smell returned.

Good results occurred in three other cases of a similar character which presented nothing special.

2. Typical cases of American hay-fever with obstruction manifest only during the paroxysms. These all showed improvement, itching of the eyes, nose and throat and sneezing relieved in every case where the remedy was used under my direction. The patients, with but several exceptions complained that the obstruction persisted in spite of the relief from other symptoms. In several instances where the remedy had

only been used for about two days the patient passed from under observation (visitors at the World's Fair) so that it could not be determined whether or not they were relieved. Two patients who had been suffering for many years were entirely relieved of all symptoms.

3. Cases in which the serum has been used without benefit, but in which relief supervened upon proper administration. Doubtless this class will include a large number of patients, particularly those who used the remedy without medical direction. The average hay-fever patient feels that he is thoroughly competent to attend to his own case. He hears of the good results of the remedy and uses it in a skeptical self-satisfying, though improper way, and, finding it of no avail, discontinues it. Two such cases were relieved by having the serum properly used. One of these, a patient of ten years' standing, who had not found any relief whatsoever previously, took the remedy with him on an Eastern trip so as to be prepared for the paroxysms which were due within a short time. He used it during attacks for two days while on the railroad journey, found that the paroxysms were not influenced and discontinued its use. On his return to the city he was directed to use a very small quantity twice a day and was required to report daily for observation. It was soon found that very small doses given two or three times a day depending upon the severity of the paroxysms and upon exposure to pollen were entirely effective and all of his symptoms disappeared with the exception of the obstruction and some of the nasal discharge which was somewhat irritating.

Another case was that of a physician who had used entirely too large a dose. The dosage being reduced, he was kept under observation and direction for a few days with positive results.

4. Cases in which the condition of the nose interfered with the action of the serum. Under this head are included the various cases in which good results were delayed, but eventually manifested. At times a considerable deformity or ridge or spur prevented the insufflation of the powder. In several other cases, the discharge was profuse, and the powder was probably washed away before it could become effective. In one case the vibrissae appeared so large and numerous that the powder failed to reach the mucosa until the patient was directed to insert the little metal instrument high up into the

nose. In another case, the nose was full of polypi which made it impossible for the patient to draw the powder up into the nose. A close investigation into points of this nature will doubtless overcome the lack of good results in many cases; certainly those who use the remedy without proper medical direction take great chances in this particular.

5. Cases in which the ordinary Pollantin was of no avail, but in which the serum produced by immunization with goldenrod and ragweed toxin was effective. This was most acceptably shown in two cases. In one the relief had been moderate with the ordinary serum and absolute with the goldenrod and rag-weed antitoxin supplied to me very kindly by Prof. Dunbar. The second case had absolutely no relief from the use of the Pollantin. Within a half an hour after the other variety of serum was used the relief was positive. This experiment was made in the presence of Dr. Dunbar. The patient's symptoms continued under entire control during the remaining portion of the hay-fever season. With the introduction of rag-weed and goldenrod antitoxin, we may confidently look for more satisfactory results, generally, in the treatment of the typical American hay-fever.

6. Cases of false hay-fever. Under this head I include three patients who were not benefited by the serum. Subsequent examination showed that they were cases of so-called vaso-motor rhinitis due to a nervous condition and not to pollen. Two of the cases have been relieved by proper therapeutics, and the other had so far resisted treatment.

7. Rose-fever of 1905. During May, 1905, three new cases have been under observation. In one case of 6 years' standing relief appeared within 48 hours. Later, symptoms again developed following a long automobile ride in the country. Since the establishment of the proper dosage, there has been no recurrence, although she now rides in the parks. Another patient essayed to use the remedy after the first day without medical direction. Relief followed for several days. After an undue exposure, she greatly increased the number and size of the dose, so that her nose was in a state of irritation. Relief appeared when proper dosage was established. The third patient has now no symptoms. In these cases the serum of last year was used. None of the cases treated last year have so far found it necessary to seek further treatment.

This list include all the cases treated last year and this

year which I consider remained long enough under attention to warrant a proper trial of the serum. It does not include several patients who remained from 1 to 3 days without experiencing relief. One of these patients wrote me that he found the serum utterly useless. The other two did not communicate with me again. In addition to these there were 5 cases for which the serum was prescribed and the patient not seen again. One of these has written that it was effective and another that it was without result. However, it is fair in considering the value of the remedy from the clinical standpoint to exclude cases of this character. In every case the dried serum alone was used.

As to the relief of individual symptoms the cases showed the following:

Itching of the eyes. Almost invariably relieved during the first two or three days without applications being made to the eyes. This is at variance with the experiences of some other observers.

Itching of the nose disappeared within two or three days.

Itching of the palate. Alleviated, but after a longer use of the serum.

Epiphora. Usually ceased within 24 hours.

Rhinorrhea. In most cases, relieved. In some cases, while other symptoms were removed this remained, but generally somewhat diminished. This appears to be accounted for on the score of vaso-motor paresis due in part to the hay-fever and in part to the local condition of the nose.

Nasal obstruction. In perhaps half of the cases, this was entirely overcome. In other cases it remained, though generally somewhat diminished. The nasal obstruction is so frequently dependent upon hypertrophies, spurs, ridges and deflections and upon vaso-motor paresis that it is not to be expected that any remedy which combats the toxin alone can entirely overcome this symptom.

Sneezing. Relief almost uniformly immediate.

Asthma. In but two cases was this symptom present during the attack. The serum seemed to have no special effect on the asthma directly, but as the other symptoms improved, the asthma likewise was benefited.

From these observations it therefore appears, first, that Dunbar's serum is effective against the distressing symptoms of the disease, in cases even where there is no proper direction

for the administration of the remedy. Second, that the probability of relief is tremendously increased by intelligent observation of the attendant conditions and by proper administration of the antitoxin. Third, that the antitoxin made by using the pollen toxin of rag-weed and goldenrod promises far better results in our American form of hay-fever than that which is at present used. Fourth, that the commoner symptoms of itching of the eyes, nose and palate, epiphora and sneezing are almost invariably relieved within a few days after the serum is properly used. Fifth, that other symptoms, such as rhinorrhea, nasal obstruction and the like which are frequently dependent upon attendant conditions may entirely disappear and in general will be somewhat if not altogether relieved. Sixth, that there are more problems to be solved in connection with the influence of pollen in the production of hay-fever and perhaps other diseases will be admitted and that an important step forward had been made by Dunbar in this work, no one can deny.

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XXI.

OTITIS MEDIA MUCOSA.¹

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In the following paper I have taken for consideration and report, the histories of a few cases that certainly belong to the exudative form of non-suppurative middle ear disease. In some of them there was a sero-mucous collection in the tympanic cavity while in others the exudate was purely mucous. Following this, the various classifications and subdivisions of non-suppurative middle ear disease, as given by our leading authors in their most recent pronouncements, are briefly reviewed, and some of their disagreements noted.

Case I. M. S. male, aet. 33, sailor, born in Denmark.

As the result of a cold in the head, has had, for one week, deafness and tinnitus (constant hissing) and blocked feeling in A. D. H. D. W. R. c/120. Tuning forks show trouble in the conducting apparatus. Great retraction and opacity of m. t., no l. r.; m. t. moderately congested. Eustachian tube opens poorly by catheterization, with sound of fluid in t. c. Mucosa of nose and naso-pharynx congested. Tube inflated and AgNO₃, gr. 20 applied to vault. Two days later no change; m. t. incised with escape of considerable stringy mucus. Two days later, still discharging mucus; H. D. W. 24/120. Two days later, m. t. closed and H. D. W. 30/120. Treatment stopped because of his ship sailing, but patient seemed in a fair way toward complete recovery. Treatment: incision once, repeated inflation and application of AgNO₃ to vault, and bougie used once.

Case II. W. S., male, aet. 38, horseman, born United States. As the result of a cold in the head, has had for two weeks deafness and tinnitus (rumbling), and blocked feeling in A. S.

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Moderate quantity of fluid visible in t. c. when first seen, May 14, 1902. Eustachian tube opens poorly by catheterization, with bubbling of fluid, but bougie passes without difficulty. Tried inflation and treatment of vault twice before opening m. t., with but little effect. Incised drum membrane, May 23, June 5 and July 17, after which patient had no further trouble.

Case III. C. P., male, aet. 40, clerk, born in United States. One month ago without evident cause had pain in A. D. which was followed for two or three days by discharge; since then there has been deafness and tinnitus (hissing) with a blocked feeling; H. D. W. R. $\frac{1}{2}$ inch. M. t. shows great retraction, marked irregular opacity, some irregularity of surface; l. r. diffused and irregular in shape. Eustachian tube opens poorly by catheterizing, with evidence of fluid in t. c.; effort to pass bougie failed. Patient hears better when lying down. Two treatments by inflation, etc., made no lasting improvement, whereupon I incised m. t., with great immediate gain in hearing and lighter feeling in head. In three weeks there was again fluid in t. c.; second incision, with gain in hearing. Heard nothing further of patient. Probably no further trouble.

Case IV. Mrs. P., aet. 38, born in United States. As a result of washing her hair, has had, for five weeks, deafness and tinnitus (roaring) in A. S. and for the first two or three days moderate pain, which she thought was a toothache. H. D. W. L. $\frac{1}{4}$ -inch. Eustachian tube opens easily by Politzerizing. M. t. very greatly retracted, no opacity; l. r. a central point of light. T. C. evidently nearly filled with exudate. M. t. was incised, and a large amount of mucus was cleared out by inflation. P. T. W. $6\frac{1}{2}$ -7. Six days later I re-opened it with escape of mucus, seventeen days later do., after which there was no further trouble, even in the face of a severe cold shortly afterwards. Treatment, besides three incisions, inflation and sol. of AgNO_3 applied to vault and mouth of tube. No special pathological condition of nose and throat, except that mucosa of vault was slightly hypertrophied, with slight excess of secretion there.

Case V. Mr. P., aet. 48, lawyer, born in United States; a so-called uric-acidemic. As a result of cold in the head, has had for eight weeks, deafness, stopped-feeling, with tinnitus (like insects) severe at first but less so at present, and for the past two weeks grumbling ("as if they might ache at any

time") in both ears. H. D. W. R. 22 inch. L. 14 inch. Right m. t. in about a normal position; considerable opacity; l. r. lessened and broken; left m. t. in about a normal position, very translucent; l. r. small and central; t. c. seems to be about $\frac{2}{3}$ full of fluid. Right tube opens fairly well to catheterizing, with large mucous rales. Left tube—scarcely any air passes upon catheterizing, but, after incision, air passes freely upon Politzerizing. Several nasal polypi have been removed during the past month or two; still one or more in right middle meatus. Patient has attacks of vaso-motor rhinitis brought on by driving (exhalation from the horse). A good deal of secretion in nose, but not much in throat. Left m. t. incised at first visit 12/11, '01, with escape of considerable sero-mucus; polyp removed from right middle meatus. 12/13, great improvement; 12/17, incised again. 12/20, incised again, after which hearing was greatly improved. One month later, 1/27, '02, had a cold with pain in A. S. followed by a most profuse sero-mucus discharge. Perforation now closed. 2/20, left m. t. again incised. 4/14 reports having felt all right until last night; had pain in A. S.; fluid now visible in t. c. M. t. incised with escape of mucus. Seen once afterward and felt all right. Treatment—Incision five times, inflation, removal of polyp from nose, adrenalin spray, and AgNO_3 applied to vault and mouth of tube.

Case VI. C. K., aet. 41, in mercantile life, born in United States. As a result of cold in the head, had been deaf (no other symptom) in A. D. one week, in A. S. one day. H. D. W. R. and L. 5 inch. Both m. tt. show great retraction and opacity, no l. r. and while no fluid line is visible, there is an appearance suggestive of fluid in both tympanic cavities. Right tube opens with much difficulty upon Politzerizing, left tube opens rather easily. Inflation and adrenalin spray, the latter used at home for twenty-four hours, having failed to do good, the next day, 10/21, '01, bougie and catheter were used, still without relief. I incised right m. t. after which by Politzerizing, I blew out a considerable quantity of rather thin mucus, with great gain in hearing. 10/26, incised left m. t. with similar result. 11/7, right t. c. again full; m. t. incised. 11/11, do. 11/22, left m. t. again incised. Patient ceased coming 12/3. H. D. W. R. 20 inch, L. 42 inch. Treatment—Inflation, adrenalin spray, incision of right m. t. three times,

left twice; AgNO_3 applied to vault, saline laxative, Turkish baths, limited use of tobacco.

Case VII. F. K., aet. 19, student, born in United States. As the result of a cold in the head, has had deafness, tinnitus (like boiling water) and slight pain in A. D. two and a half weeks, deafness in A. S. one week. Tuning forks show some internal as well as middle ear involvement. H. D. W. R. C. L. 3 inch. Both membranes show marked retraction and opacity, and l. r., small, together with considerable congestion. In the left t. c. some appearance of fluid. Good-sized hypertrophy of 3d and 5th tonsils. Both tubes open easily to Politzerizing. Both membranes incised with escape of moderate amount of sero-mucus. One month later, the enlarged 3d and 5th tonsils were removed. Two months later, no evidence of fluid in either t. c. H. D. W. R. $\frac{1}{2}$ inch. L. 20 inch. Right ear was the one which had originally shown the most nerve involvement. Treatment—Incision of both drums once, inflation, removal of 3d and 5th tonsils. Later, strychnia and phospho-albumen internally.

Case VIII. A. F., male, aet. 45, salesman, born in United States. As a result of cold in the head has had for two and a half weeks deafness, tinnitus, autophonia, and stopped feeling in A. S. Hears his own breathing in this ear. Tube opens easily to Politzerizing. H. D. W. L. $\frac{1}{4}$ inch. Clear picture of fluid in t. c., which on incision proved to be largely serum, with small amount of mucus. Only the one incision was needed, the hearing returned to normal after a few inflations, and applications of AgNO_3 to vault.

Case IX. Mrs. D., aet. 48, born in United States. As a result of cold in the head, has felt for ten days deafness and stuffy feeling in A. S. H. D. W. L. c. Small quantity of fluid (probably largely serous) visible in t. c. Tube opens easily to Politzerizing. Fluid disappeared with simple inflation and AgNO_3 application to vault. Symptoms recurred five months later, but again yielded promptly to same treatment.

Case X. J. D., aet. 41, clerk, born in Ireland. Apparently as a result of a very slight cold in the head for five or six days, deafness and tinnitus, with autophonia and a plugged feeling in both ears, the onset being sudden. H. D. W. R. 5 inch. L. 7 inch. Right m. t., great retraction, marked irregular opacity, l. r. half size, tube opens with great difficulty to Politzerizing; left m. t. great retraction, moderate opacity

inferiorly, l. r. almost full size. Tube opens with moderate difficulty to Politzerizing. With bougie, inflation, and AgNO_3 to vault both ears recovered, but six weeks later had another cold, and A. S. showed evidence of fluid in t. c. Incised m. t. and blew out some very thick mucus. After another treatment had no further trouble.

Case XI. H. B., aet. 35, salesman, born in United States. As a result of blowing the nose too violently, has had, for **five** or six weeks, deafness and tinnitus (like hum of mosquito) in A. D. with numbness of auricle. H. D. W. R. 5 inch. M. t. shows marked retraction and is very translucent; l. r. small and marginal. Though no fluid line is visible, it looks as if there was fluid in t. c. Tube opens easily to Politzerizing. Rather excessive secretion from naso-pharynx. Faucial tonsils moderately enlarged. Treated by inflation, and applications of AgNO_3 to vault. During the treatment patient developed an acute inflammatory attack in the same ear. This subsided, fluid disappeared, and patient heard W. 5 feet after about two months. On account of the continued numbness of auricle I incised m. t. with escape of moderate amount of mucus, after which that symptom subsided.

Case XII. Mrs. B., aet. 34, born in United States. Without apparent cause, deafness and tinnitus in A. S. three years, in A. D. six months. Tuning forks show slight nerve involvement. Right m. t. shows considerable retraction and opacity; l. r. lessened; left m. t. shows great retraction and opacity; l. r. small. Both tubes fairly open to catheter. This case is mentioned briefly here because on two or three occasions, when catheter was used, small plugs of mucus have been dislodged from the right tube with temporary gain in hearing. But I have never seen fit to incise the membrane because on no other occasions have there been symptoms which would lead one to think of a collection of mucus in either ear.

The cases described up to this point are, perhaps, not unusual; most of them are not difficult of diagnosis and when the diagnosis is properly made treatment is usually attended with gratifying results. As much cannot be said of the following cases:

Case XIII. W. S., aet. 62, born in United States. In mercantile life. First seen 1/4, '96. Deafness and tinnitus in both ears some fifteen years. Previous to an attack of pneumonia, nine months ago, had occasional stopped-feeling in one

or other ear, which since then is constant in both. Has had nasal polypi removed fifteen years ago, again six or seven years ago, and there are now more or less of them in both middle meatuses. H. D. W. R. o. L. $\frac{1}{4}$ inch. Cicatrices and chalk deposits in both membranes, which respond very poorly to Siegle. Both tubes open poorly to catheter, and bougie passes only with great difficulty. Six years later, when under treatment, there seemed to be fluid in both t. c.'s, which after m. tt. were incised proved to be a very thick mucus; this continued discharging some days (at one time over a week) after incision. Following this the patient had a lighter feeling in the head, but did not hear materially better. Radical work in the nose was not allowed, so I had to be content with keeping a breathing space open. An essential part of the treatment in this case, the thing that really made his ears feel more open, and temporarily improved hearing, was, besides repeated incision, the introduction of large Eustachian bougies and leaving them in place several minutes at a time. Patient later died of malignant disease of either stomach or liver.

Case XIV. Mr. A., aet. 62, merchant, born in United States. Without known cause, has had deafness and feeling of weight in A. D. fifteen or twenty years. H. D. W. R. o. conv. 5 feet. M. t. has a bulged appearance (as if from blowing the nose too hard); great opacity, considerable congestion; no l. r. Tube opens very poorly to catheter. 10/11, '01, (first visit). M. t. was incised, after which inflation brought out a moderate quantity of very thick mucus; 11/11, again incised; 12/13, do., with expulsion of a large quantity of thick mucus; 12/21, do.; 12/26, do.; 12/28, edges separated and cavity emptied again; 12/31, again opened. 1/3, '02, do.; 1/6, do.; 1/13, do. This last opening did not close until 1/30, and in the meantime there was pretty constant escape of mucus from the ear. I now began the use of a large bougie once in five to seven days, leaving it in the tube five to ten minutes, and by this means the hearing was kept as good as by repeated incisions, but no permanent result was obtained, and patient, although improved, after six months of faithful treatment ceased his visits. As complicating, and perhaps causative, conditions, were a suppurating frontal sinus and nasal polypi, while the patient's general health made a radical operative interference very undesirable. Treatment consisted of—incision twelve times, Eustachian bougie(large size) and inflation

with catheter, removal of nasal polypi, washing out of frontal sinus. Adrenalin solution, 3% camphor-menthol oil, and other things were injected through the catheter, Eustachian tube and t. c.

Case XV. Mr. W. M., aet. 58, in shipping business, born in United States. Without known cause, unless it was "the use of a spray in the nose," has been dull of hearing one week, with a dull ache (relieved by pulling the tragus forward) in A. D.; the trouble seems worse morning and evening, passing off during the day. H. D. W. R. 18 inches. Some congestion of canal walls; m. t. shows marked retraction, moderate opacity, l. r. small and dim. Tube almost too open, and air enters t. c. with a perfectly dry sound. Inflated twice, stopped atomizer, and ordered albolene in compressible tube, after which there was no further trouble for nearly eight months, when on 12/31, '03, he reported sensations in the same ear similar to those of the previous attack. Has considerable mucous secretion from nose and naso-pharynx. 1/8, '04. For the last twenty hours has had some pain in A. D. for which I ordered leeches, dry heat, and applied AgNO_3 gr. v.—oz i, to vault and tube-mouth. This attack subsided under inflation and application of AgNO_3 to vault, until on 3/4 he reported that for a week there had been a plugged feeling in the ear; m. t. inflamed, but there was no pain. 3/12, H. D. W. up to $2\frac{1}{4}$ inches. 3/17, ear again more stuffy. By using catheter and the Politzer bag as an exhaust drew some thick mucus out of the tube with improvement in the feeling of the ear. 3/18 and 3/19, do.; 3/24, I incised m. t. and with Politzer bag blew out a large piece of solid mucus. By 3/28, the stuffy feeling had returned, and with the catheter I blew out another large piece of mucus through the opening made last time. Injected through the catheter, Eustachian tube and t. c. 3% camphor-menthol oil as I had already repeatedly done. 3/29, ear has felt stopped up all day; some tenderness over the region of the Eustachian tube; m. t. much reddened. Did nothing but apply AgNO_3 gr. 20 to tube mouth and ordered dry heat. 3/30, patient reports severe pain early part of last night, followed by free discharge. 3/31, more or less pain throughout yesterday, worse last night. Ear discharging profusely; slight tenderness at mastoid apex. Almost continuous, loud, pulsating tinnitus. 4/1, pain and tenderness less. 4/2, discharge profuse; very little tenderness; complains

of a continuous dull ache, and continuous pulsation. 4/5, almost no change except that today temperature rose to 101.5° . 4/6, temperature, 3 p. m., 100° . Dr. Gorham Bacon saw him with me this evening and although discharge was free, advised additional opening of m. t. which was done early the following morning as an "internal Wilde's" incision. 4/9, There having been no change in the symptoms the mastoid was opened. There was found an astonishing amount of pus and dead bone, involving the tissues around the antrum, uncovering the lateral sinus, extending far posteriorly, as well as to the apex, which came away in one piece. Healing of the wound was uneventful, dressings ceased 6/3. The hearing has never improved in this case as we expect it to after mastoid operations. At present H. D. W. $\frac{1}{4}$ inch- $\frac{1}{2}$ inch. No trace of mucus in Eustachian tube or t. c.

Case XVI. Mr. M. H., aet. 41, salesman, born in Germany. As a result of "catarrh," progressive deafness in A. S. one year, beginning at that time with severe earache lasting three or four days, for which he says m. t. was incised but without discharge other than blood immediately following the incision. H. D. W. L. $1\frac{1}{2}$ inch, P. Pol. 12 inches. M. t. shows very great retraction, great opacity, l. r. small and central. Slightly congested, responds scarcely at all to Siegle. Eustachian tube opens with the greatest difficulty to Politzerizing. In A. D. for the past three or four months patient has felt what he described as a drawing or pulling sensation, which is increasing. H. D. W. R. $5\frac{1}{2}$ feet. M. t. shows great retraction and opacity; l. r. small and central; considerable congestion of malleus and attic region. Moves very little to Siegle. Eustachian tube opens with difficulty to Politzerizing. Patient says he is very largely a mouth-breather, due in his judgment to contracted condition of the upper part of throat, the result of removal of adenoids and uvula four years ago. The nostrils seem sufficiently open. The whole naso-pharynx and pharynx seem contracted, with reddening and thickening of the mucosa, this condition extending markedly to the epiglottis and the false chords. It was not until the patient had been more or less regularly under my care for five or six months that I suspected the presence of mucus in the t. c., when, owing to the continued stuffy feeling, the tendency of the hearing to retrograde, and the somewhat suspicious sounds when using the bougie and catheter, I, on 11/15, '02, incised the left m. t.

and blew out a large quantity of very thick viscid mucus, with marked improvement in hearing and feeling. On 1/7, '03, I made this note: "Upon introducing the finger into the naso-pharynx there was a sensation as of adhesion between the surfaces, which seemed to separate with a tearing sensation, and some bleeding, but was followed by a much more open feeling for breathing, etc. 1/4, re-opened left m. t.; 3/9, repeated the introduction of the finger into naso-pharynx with the same sensations and the same good effect. 4/1, severe pain in A. S. the past twenty-four hours. (I had not seen him for six days). M. t. much inflamed. I incised it and blew out thick mucus. Inflammation quickly subsided. 6/10, again incised m. t.; 7/1, do. 10/22, severe pain last night; m. t. much inflamed; incised; pain and tenderness gone by 10/24. 11/24, re-opened m. t. with escape of thick mucus, which continued to run for three or four days. 12/30, four or five days ago had severe pain in A. D. for one day, and since then moderate pain and slight discharge. M. t. much inflamed and shows a minute perforation which I at once enlarged, with immediate relief of pain. 1/7, '04, ill with a severe cold; after a few days pleurisy developed. A. D. still discharges slightly. Extreme deafness in both. 2/10, all his symptoms have greatly improved, H. D. W. R. 12 inches, L. 4 inches. This was the last I saw of patient. It is evident that the results of treatment, as to permanency, were very unsatisfactory. Just what was the condition in the naso-pharynx, which was probably the underlying cause of his ear troubles, I do not know. A distinguished colleague, and fellow-member of this society, to whom I sent him for an opinion, agreed with me.

Case XVII. Mrs. D., aet. 44, born in United States. Was first seen 11/8, '01. As the result of a cold in the head, she has been deaf, with rather loud pulsating tinnitus, and stopped feeling in the right ear for three weeks. H. D. W. R. 1¼ inch, L. 14 inches. Right m. t. shows great retraction and opacity, except for a large cicatrix lying inferiorly in which is a small l. r. Left m. t., shows great retraction, and opacity, l. r. small. Air entered right t. c. very poorly until after incision (in posterior part of cicatrix) when it went through freely by Politzerizing and forced out considerable viscid mucus. P. T. W. R. 22 inches, L. 12 inches. After a second inflation a few days later H. D. W. R. 22 inches, L. 18 inches. Returned two months later, 1/25, '02, with evidence of fluid in right t. c.

and H. D. down to R. 2 inches, L. 8 inches; after incision of right m. t. and inflation, R. 5 inches, L. 12 inches. 4/14, left m. t. incised. 5/16, right m. t. considerably inflamed. 5/22, incised it. 8/13, incised left m. t. H. D. W. R. 2 inches, L. $\frac{1}{2}$ inch. 10/7, H. D. W. R. 1 inch, L. 3 inches, incised right m. t. 10/30, both dull, H. D. W. R. and L. $\frac{1}{2}$ inch. Incised both, P. T. R. 4 inches, L. $2\frac{1}{2}$ inches. 12/1, re-opened both. 12/8, re-opened left. 1/13, '03, re-opened right. 3/27, both ears have been comparatively free from crackling since last seen, H. D. W. R. 8 inches, L. 14 inches. 5/15, hearing down again, R. and L. 3 inches. Incised both membranes. 7/22, do. 7/31, incised left. 11/7, do. 11/12, incised right. 1/23, '04, incised left. 3/12, incised right. 4/5, incised left. 4/11, do. 4/29, both. 5/14, left. 5/20, right. 5/31, left. 9/6, both. 10/14, left. 11/4, pain twenty-four hours in left, membrane inflamed. 11/10, incised left. 11/16, right. 12/1, right. 12/20, left. 12/29, H. D. W. R. and L. c., incised both. 12/31, both still open, A. D. dry, A. S. discharging muco-pus. 1/5, '05, A. D. open and dry. A. S. closed. 1/10, A. D. still open, incised left. 1/20, incised left. 1/30, again incised left, in which there is constant rather loud pulsating tinnitus, and m. t. considerably inflamed. 2/2, A. S. still open and dry. Incised right, which is now moderately inflamed and pulsating. H. D. W. R. $\frac{1}{2}$ inch, L. 1 inch.

I do not need to tell you how unsatisfactory treatment has been in this case. The patient is as badly off, perhaps worse than at any time during the past three years. There have been times when the condition was quite comfortable for a longer or shorter period. The symptoms have been in brief—deafness, at times pulsating tinnitus, expressed by the patient as “thumping in the ear,” at times autophonia, occasionally crackling, when she lies down feels as if something were moving in the ear. No dizziness, no interference with cerebration. Has a good deal of secretion from nose and naso-pharynx. Treatment has consisted of frequent repeated incisions, (right 18 times, left 23 times), and not one of them a dry tap! Inflation with catheter and with Politzer bag, bougie, AgNO_3 applied to vault, AgNO_3 injected through the Eustachian tube into t. c. and out into the external canal, and into t. c. from the external canal and forced through into the throat. Syringing with saline, etc., through catheter, Eustachian tube, t. c. and out the external canal, and from the canal through t. c.

Eustachian tube and out through the nose. General tonic and climatic treatment. A case of "Help Wanted!"

Case XVIII. Mr. J., aet. 55, merchant, born in United States. Apparently as the result of using the nasal douche, has had for between two and three months deafness and tinnitus (constantly, but of varying character), and great feeling of pressure in A. S. Same feeling to a very slight (almost inappreciable) extent in A. D. I first saw him 6/24, '04. At that time he had been under treatment by his family physician for two months. H. D. W. R. 14 inches, L. c. Right m. t. position about normal, marked irregular opacity, l. r. lessened. Drum moves freely to Siegle. Eustachian tube opens poorly to catheter, quite well after bougie. Left m. t. great retraction, scarcely any opacity, l. r. small and central. Drum moves very little to Siegle. Eustachian tube does not open to catheter, and I failed to get bougie more than part way through, but even this permitted air to pass quite well, and without distinct sound of fluid in t. c. Some enlargement of fifth tonsil—general redness of nasal and naso-pharyngeal mucosa, only slight excess of secretion from naso-pharynx. Treated with bougie, inflation, massage, and application of AgNO_3 to vault at frequent intervals up to 9/6, with distinct gain in hearing, up to W. R. 28 inches, L. 20 inches, but there was constant tendency for the hearing to grow worse, and with it a return of the feeling of pressure. I incised left m. t. with escape of considerable viscid mucus. 9/23, again incised left m. t. 11/18, do., mucus thicker than heretofore. 11/26, do. and instilled AgNO_3 gr. $1\frac{1}{4}$ to oz. 1, into t. c. 11/30, patient reports that he had pain for several hours after last treatment. Sensation of fullness seems now almost worse than before. 12/7, still has most annoying sense of fullness: incision gave vent to a considerable amount of sero-mucus (much thinner than before). 12/14, has had great relief. 12/22, A. S. again much stopped up. Incised m. t. and blew AgNO_3 , $1\frac{1}{4}$ gr. to oz. I through catheter into t. c. Ordered muriate of pilocarpine gr. $\frac{1}{8}$, t. i. d. by mouth. 12/29, A. S. again stopped up; H. D. W. R. 2 inches, L. c. Again incised m. t. and injected silver solution through catheter into t. c. 1/19, '05, patient has still the feeling of fullness, but the intense pressure is absent; W. L. c. P. T. (incision, bougie, and catheter inflation) W. L. 6 inches. Not seen since that date, but heard by telephone that he was hearing and feeling much better. Here

is another case in which I have made but little progress toward permanent cure. Treatment has consisted of repeated incision (8 times), bougie and inflation (catheter and Politzer), massage, AgNO_3 applied to vault, injected through Eustachian tube into t. c. and from external canal into t. c. and down through the Eustachian tube. Is still under treatment. More "Help Wanted!"

Thus there have been 11 unilateral cases and 7 in which both ears were involved, 18 cases and 25 affected ears.

Etiological factors have been, cold in the head, 9 times; nasal polypi, 2; vaso-motor rhinitis, 1; hypertrophied 3d and 5th tonsils, 1; hypertrophied 5th tonsil, 1; blowing nose too hard, 1; "catarrh," 1; nasal douche, 1; use of atomizer, 1; washing hair, 1; no evident cause, 3.

Symptomology. Deafness, 25; tinnitus, 16; blocked feeling, 15; autophonia, 4; pain (usually slight), 5; numbness of auricle, 1; appearance of membrane—great retraction, 17; moderate retraction, 4; no retraction, 3; bulged, 1; great opacity, 12; moderate opacity, 8; no opacity, 5; moderate congestion of m. t., 5; l. r. absent, 11; l. r. $\frac{1}{2}$ size, 9; l. r. full size, 5.

Eustachian tube narrowed, 10. Eustachian tube not narrowed 15. Appearance of fluid through m. t. 9. Hears better lying down 1. Feels something move in ear when lying down 2.

M. t. not incised, 6. Incised once, 6. Incised twice, 4. Incised three times, 3. Incised five times, 1. Incised seven times, 1. Incised eight times, 1. Incised twelve times, 1. Incised eighteen times, 1. Incised twenty-three times, 1. Much improved or cured after relatively short courses of treatment, 13.

A striking feature of this group of cases is their proneness to intercurrent acute attacks of middle ear inflammation, eight or ten such being recorded, one of these going on to extensive mastoid disease. In considering the position of such a group of cases in the general classification of non-suppurative middle ear disease, it is evident that they belong to the moist or secretory type. But in glancing through what the authorities have to say on the subject, I was impressed with the fact that virtually none of them has described such cases as some of those I have outlined to you in detail. The nearest to it is a case described at some length by Burnett in his text-book published in 1884. With your kind forbearance I should like

to run over with you some of the classifications of chronic non-suppurative middle ear disease.

Bishop (last edition) describes two classes—Hypertrophic middle ear catarrh, and adhesive middle ear catarrh (commonly called sclerosis). Hovell says, chronic catarrh appears in two principal forms: in one, the process is mainly catarrhal, i. e., accompanied by more or less abundant secretion, in the second, the process is marked by hyperplasia of the mucous membrane, adhesions between various parts (sclerotic form), and thickening and condensation of tissues. Barr—1. Exudative catarrh of the middle ear (synonyms—mucous or mucoserous catarrh of the middle ear; catarrh of the middle ear; otitis media catarrhalis; obstruction of the Eustachian tube). 2. Non-exudative, or interstitial inflammation of the middle ear, (synonyms, chronic dry catarrh, adhesive processes in the middle ear; proliferous inflammation of the middle ear; chronic catarrh of the middle ear; sclerosis of the middle ear).

Grayson—Chronic catarrhal otitis media.

Cheatle, in Posey and Wright—

(a) Hypertrophic catarrh. (1) Chronic catarrh of the Eustachian tube. (2) Chronic catarrh of the middle ear tract.

(b) Atrophic catarrh or sclerosis.

(c) Changes in the lining membrane due to variations in pressure.

(d) Changes in the lining membrane due to deficient blood supply.

Dench in DeSchweinitz and Randall. Non-suppurative inflammation of the middle ear may be either hypertrophic or hyperplastic (meaning what is ordinarily known as sclerosis of the middle ear). Bacon—Chronic catarrhal otitis media should include cases of *secretive catarrh*, in which there are considerable hyperemia and swelling of the mucous membrane, followed by the formation of adhesions and anchyloses of the ossicles, as well as cases of *sclerotic or interstitial inflammation*, which is confined to a limited portion of the tympanum, usually the region of the fenestræ.

Holmes, in DeSchweinitz and Randall—Various classifications (of middle ear disease) have been attempted; the most practical is a clinical basis; where we divide the inflammations into (a) sero-mucous form of middle ear catarrh; otitis media catarrhalis acuta; secretory form of middle ear catarrh; otitis media serosa; catarrh of t. c. and Eustachian tube. (b) Proliferous inflammation of middle ear. (c) Muco-purulent in-

flammation of middle ear. (d) O. m. p. a. (e) O. m. p. c. Jacobson and Blau, 3d edition—Chronic middle ear catarrh; included in this term are a large number of disease processes which differ from one another pathologically and clinically. It seems practical to divide them into two large groups—*moist* (secretory), and *dry*. The latter result from the former.

Dench, text-book, last edition. Chronic catarrhal otitis media—under this head various affections of the tympanum have been described. The selection of this name is particularly unfortunate, since it conveys the impression that the disease is really a complicating lesion of some condition in the nose or naso-pharynx. Catarrhal inflammation is a term applied to a simple inflammation of any m. m. It may occur in the ear or elsewhere, constituting a primary disease entirely independent of any lesion in the upper air passages.

In passing, let me quote from Grayson: "With our present knowledge of the pathology of catarrhal affections of the mucous membranes and of the tendency of this form of disease in one region to extend by continuity of tissue to others, it may be stated with little fear of contradiction that chronic catarrh of the middle ear is invariably secondary to a similar pathological process in the nose and naso-pharynx. In view of the anatomical and physiological relations of the nose, throat, and ear a primary and independent chronic catarrh of the last-named cavity is inconceivable."

Dench divides cases into (1) A hypertrophic inflammation, with a swelling of the mucous membrane of the t. c., due to a chronic venous congestion; as a result, the glandular elements produce an excessive amount of secretion. (2) A hyperplastic inflammation—the new tissue being firm and fibrous, secretion diminished, walls of blood vessels thickened, and a true sclerosis results.

Burnett—Chronic catarrhal inflammation—two chief forms, 1 a) the *secreting* or *moist*, (1 b) the *non-secreting* or *dry* form. He says: "To these aspects of the chronic disease, different names, and in some cases vastly different natures have been assigned."

Politzer, last edition:

1. Middle ear catarrh—(Ot. med. catarrhalis).

a *The secretory form of middle ear catarrh*. (Synonyms—sero-mucous middle ear catarrh; Ot. med. serosa; exudative middle ear catarrh; tubo-tympanic catarrh.

b. *Catarrhal adhesive processes in middle ear.* Chronic middle ear catarrh. (Synonyms—Ot. med. cat. chronica).

Allied conditions—narrowing of Eustachian tube. Otosclerosis. Our O. m. c. a. he classes as the first of the

II. Muco-purulent inflammations of the middle ear mucous membrane.

Walb, in Schwartz's text-book:

2. Catarrh of tympanic cavity—

a. Acute catarrh (O. m. c. a.)

b. Chronic catarrh of t. c. (O. m. c. c.)

1. Simple form (O. m. c. c. simplex).

2. Hypertrophic form of chronic catarrh (O. m. c. c. hyp.)

3. Sclerosis of mucous membrane of t. c.

As intimated above I fail to find here any accurate description of the cases under consideration, and a part of the object of this paper is to call your attention afresh to the paper by Alderton on "Otitis Media Mucosa" read before this Society and published in the *Medical News* for September 21, 1901, and I wish to extend to him the credit, so far as my investigations go, of having first accurately described this condition. My observations for the most part agree very closely with his, although differing in some minor points. All of my cases occurred in adults—one was only 19—the others between 33 and 62.

As opposed to Alderton, I practically never found tenderness to the touch of the parts around the auricle. I have seen throbbing (pulsating) tinnitus in only two or three cases. Again, none of my cases spoke of difficulty in concentration or of cerebration. I found autophonia in relatively few—Alderton in most of his cases.

Alderton says, "the patient is unhappy, fearful for the future, and unable to attend to business." Beyond the point of being "unhappy" my patients have not been disturbed in this way.

I have had no complaint of dizziness, as Alderton has. Again Alderton finds "the m. t. in about its usual position—sometimes bulged." In a large proportion of my cases there was "great retraction" of m. t., bulging in only one. The congestion of the m. t. spoken of by Alderton was present in only a small proportion of my cases. There was, as Alderton says, no fluid line discernible in the pure mucosa cases—it was seen in some of the sero-mucous cases. What Alderton

says about the results of changing the position of the patient's head, and of the results of inflation before and after incision, as well as of the difficulty of emptying the t. c., is absolutely borne out by my observations.

The results of treatment are eminently satisfactory in a considerable proportion of cases—seemingly not in as large a proportion of my own cases as I am led to believe has been the case with others. With Aldgerton, again, I would give easily the first place to incision and evacuation of the t. c. together with inflation and suitable treatment of the naso-pharynx.

To revert for a moment to the general classification of the subject, in view of what I have quoted to you from our leading writers on Otology, again in view of the fact that sclerosis of the middle ear is being, perhaps has been, withdrawn from the category of middle ear catarrh so called, I would venture to ask whether or not the time may not be ripe for some new classification or subdivision of the general group known as non-suppurative middle ear disease. I would further suggest that it might come within the province of such a leading society as this to give out, after a full discussion of the subject at some one of our general society meetings, some authoritative utterance upon the subject.

130 Montague Street.

XXII.

A CASE OF OTOGENOUS INFECTIOUS THROMBOPHLEBITIS WITHOUT FEVER.*

BY DR. G. ALEXANDER.

Cases of mild infectious thrombophlebitis of the lateral sinus are rare, and therefore I am justified in reporting this one on account of the wide spread destruction and large thrombus found at the operation, which was in distinct contrast to the mild course of the entire disease.

Michael G., 45 years old, day laborer, at Dornbach, Lower Austria.

Diagnosis—Otitis media suppurativa subacuta dextra. Osteoperiostitis processus mastoidei dextri. Thrombophlebitis sinus lateralis dextri.

History—Patient has had trouble with his ear since last August, dating apparently from a cold (lying on damp ground). Deafness, earache, headache since beginning of trouble. Since beginning of October, has had aural discharge, with continuance of pain. No fever, temp. 37° — 37.4° . The patient's condition is good with the exception of some spontaneous pain behind the ear. Appetite good. No chill.

Status præsens—Well nourished, strong individual. No changes in abdominal or thoracic organs.

Aural Findings—Skin of right meatus macerated; fetid pus deep in canal. After cleansing, it is found that the meatus is narrowed as much as possible in its depths, and no details of the drum are visible. Behind the auricle and mastoid is a tumor the size of a gulden (fifty-cent piece. Trans.); the skin over it is slightly stretched, but otherwise unchanged. The tumor is painful, both spontaneously and on pressure, and there is distinct fluctuation.

Left drum slightly cloudy; hammer vessels injected. Weber on right side. Rinne on right side negative with considerable

shortening of air conductivity and lengthening of bone. On the left side the difference is slight; some lengthening of bone conduction. Perception of deep tones slightly diminished on both sides. Watch and acoumeter positive by bone.

Hearing.	Right.	Left.
Speech	1.0 m.	1.0 m.
Whisper	0.0 m.	1.0 m.
Politzer's acoumeter	0.0 m.	1.0 m.

Fundus oculi normal; no pathological constituents in urine. Temp. 37° — 37.4° .

Operation in quiet chloroform narcosis, (Alexander) Nov. 7, 1904. Typical cutaneous incision, and opening of mastoid. Latter softened and filled with pus. In order to remove diseased portion, the entire mastoid process had to be removed. As a result there was a large bony defect of the middle and posterior cranial fossa, laying the dura bare for the space of a five kronen piece (about one dollar. Trans.) The dura is everywhere covered with grayish-red granulations to a height of 3 mm., from between which wells up a large amount of fetid pus. The dura near the sinus, as well as the wall of the sinus, is considerably changed (a second, horizontal incision, 3 cm. long, was made backwards from the lower border of the cutaneous incision). The neighboring portion of the occipital bone was also involved. There was an abscess over this of the size of a gulden, which contained fetid pus. After the other cavities had been treated, the sinus was incised. It was completely thrombosed. The first drops of blood were found at a depth of 5 mm. The thrombus was fetid in places. The incision in the sinus was covered by strips of iodoform gauze and the wound was dressed.

Course entirely normal.

Temperature:—11/7, 37.2° - 37.5° ; 11 8-11/10, 36.9° - 37.4° ; 11 11, 36.7° - 37.5° ; 11/12, 36.4° - 36.7° ; 11 13, 36.7° - 37.2° ; 11/14-11 19, 36.4° - 36.8° ; 11 20, 36.3° - 37.1° ; 11/21-11 28, 36.4° - 36.9° .

Patient feels entirely well. Got up from bed on fifth day. Strips were shortened. Meatus dry. Gauze entirely removed Nov. 14, after softening strips with hydrogen peroxide. Never any pus. Beginning of granulation. Opening of sinus closed. Dressing changed every second day since then. Drum intact, dull; antrum filled with granulations.

November 20. Secondary suturing of retroauricular wound; drainage through lower angle of wound.

November 24. Dressings changed. Wound healed by first intention; suture removed.

November 25. Patient allowed to go home for private treatment.¹

As stated in the beginning, the noteworthy point in the above case of pyemia lies in the contrast of the symptoms before the operation and the uneventful course with the findings at the operation, which consisted of extensive disease of the dura of the posterior and middle cranial fossa and a purulent thrombosis of the sinus. *This purulent thrombosis gave the patient scarcely any trouble. There were no rise of temperature, no chills, and no pyemic metastases in spite of the extensive lesions.* The difference between the course and the findings at the operation allowed us to refrain from laying bare the jugular.

I have found no similar case of infectious thrombus without fever in the literature. The case of Kolb² (A Case of Thrombosis of the Sinus of the Brain, *Berlin, klin. Wochensh.*, 1876, No. 46) in which the diagnosis was made from the edema and hyperemia of the mastoid, etc., without operation, will not stand criticism.

To explain the cause of the unusual course of this case, recourse must be had to its bacteriology. The examination, made twice in the Pathologico-Anatomic Institute (Prof. Weichselbaum) gave a similar finding for the pus in the abscess and in the thrombus: microscopic; diplococci, positive to Gram, often with a typical capsule: culturally; colonies of a diplococcus which were characterized by their distinct mucous appearance on agar, but otherwise agreed with the diplococcus pneumoniae.

It must remain undetermined whether the diplococcus which is characterized by the mucous appearance of its colonies is to be distinguished from the pneumococcus, and whether thereby the unusually mild course of the thrombophlebitis in this case is to be explained.

(1) Completely cured since end of Dec., 1904.

(2) Cited from Hessler, "Die Otogene Pyaemie, Jena, 1896.

XXIII.

THE SUBMUCOUS WINDOW RESECTION OF THE NASAL SEPTUM.

BY PROF. GUSTAV KILLIAN,

FREIBURG, I/BR., GERMANY.

TRANSLATED BY E. EDWIN FOSTER, M. D.,

NEW BEDFORD, MASS.

For a long time it has been my intention, and my students and the visitors to my clinic have urged me, to publish the way in which I perform the submucous window resection of the nasal septum, but unfortunately I have been hindered from so doing by more urgent work. Various ways of performing the submucous operation have of late been written, and different opinions have arisen as to the share I have taken in the development of this method, therefore I have decided not to delay this description any longer.

Most of the deformities of the nasal septum have their origin from an injury. They are located anteriorly in the region of the cartilaginous septum, and have the shape of a bow or angle, producing a narrowing or closure of the nasal cavity into which they project. Generally they are associated with an alteration in the shape of the external surface of the nose. There is no doubt that these cases were earlier chiefly the subjects of surgical intervention. The submucous method of correcting these deformities was first done, as is described in the current historical article by Suckstorff.

These operations were generally performed by the surgeon without the use of artificial light; therefore their object was only incompletely accomplished.

The rhinologic technic came to the aid of this method first through Hartmann; then through Roux (1886), and Juracz (1888) a high grade of perfection was reached. It appears to me that Krieg was the first to prepare the way for the opera-

tive treatment of extensive and deep-seated deformities of the septum. He removed the mucous membrane of the side of the septum operated upon, because it was in the way during the operation.

As the importance of correcting moderate thickening and bending of the cartilage and bone became more evident, one was content to remove these ridges and spurs by the different methods, and leave the deviation uncorrected. This was also my standpoint at the end of the nineties. The use of Krieg's method taught me at first to remove the whole of the central divergent segment of the nasal septum, and then, above all, to thoroughly resect the deep-lying part of the deviation. Those cases with marked ridges, through overgrowth, I also treated in a similar way, and the saw gradually went out of use in my clinic.

What did not please me in this operation, although the remainder was very satisfactory, was the long process of healing. Without careful treatment, occasional removal of granulations, cauterization with nitrate of silver, the use of tampons, etc., one could not expect satisfactory results.

In those cases where a mucous flap had been left, the healing took place much better than where the mucous membrane had been destroyed; and a well applied flap healed still better, with little, if any, after treatment. Thus the advantage of a complete preservation of the mucous membrane became apparent. At about this time Hartmann made known his new nasal forceps (Hartmann's Conchotome), which made possible the removal of cartilage and bone from a very narrow space. I had also learned with my "rhinoscopia media" to make the deep and narrow parts of the nasal cavity accessible and easy to survey, so I began to use my long specula and Hartmann's forceps in the resection of the septum. The mucous membrane flap could, with the use of my specula, be easily held out of the way and not interfere with the operation.

Finally I proved to my satisfaction that, with a single opening through the mucous membrane at the nasal orifice, the two mucous layers could be elevated from the cartilaginous and osseous septum and held apart with my long specula, so that, with Hartmann's forceps, under the direction of the eye, the whole deviating cartilaginous and osseous part of the septum could be resected to any depth that one desired. The cases thus operated upon healed so rapidly and satisfied me

so well that I desired to make it known to my fellow-specialists at the Münchener Naturforscher-Versammlung. As there was a scarcity of material for this meeting, I offered the operative treatment of the deviation of the septum as a subject for discussion, and as an introduction I reported in detail my method (vide Transactions of the Gesellschaft Deutscher Naturforscher und Aerzte, 71. Versammlung zu München, II. Teil, II. Hälfte, S. 392, Sitzung am 22 September, 1899). There ensued a lively discussion, in which I and Bönninghaus, especially, differed as to the pros and cons of the submucous operation. In the report of the proceedings of the meeting, however, there was only an abbreviated account of the treatment of our subject, and my review I made as short as possible, reserving all details for a more complete publication, which, unfortunately, has not appeared until now.

This could have given the impression that I was satisfied with the operation as given out five years ago, but the opposite is the case. There is hardly another operation to which I have given so much attention and care, as to the submucous window resection of the septum. I have endeavored continually to improve the technic, and again and again I have constructed and tested new instruments. My preference for this method has been constantly increasing, because the healing and results throughout have been so remarkable.

The indications for this operation became more and more numerous, and now I am convinced that this operation should be used whenever there are sufficient reasons for any operative interference.

My students and the visitors to my clinic have learned my technic. My instruments are listed in Fischer's (Freiburg i/Br) catalogue, and can be purchased in nearly any country. (F. A. Hardy & Co., Chicago, Ill., are Fischer's American agents.)

At a number of Congresses I have privately demonstrated and advocated the submucous resection, but this kind of promulgation does not appear in print. It also appears that it is not known in Vienna, notwithstanding that I have often had visitors from there.

Much has been omitted from the earlier presented work, which I, in the course of time, have tested and proved to be of less value than the present described procedures.

My experience is not from a dozen cases, but on the contrary from 220 which are recorded in the operation-book of

my clinic (1899-1904). I have done the most of these, the others having been done by my assistants.

The abnormal form of the nasal septum differs essentially in accordance with the origin. Through disturbances in growth there occurs a bending in part or the whole of the septum, but both can be combined so as to produce an irregular deformity. The strongest convexity usually corresponds to the upper edge of the vomer, but the quadrangular cartilage can be alone deformed, either below or high up; in the latter case the lamina perpendicularis of the ethmoid is generally involved in the deformity. Ridge formation rarely fails in such *in toto* deviations of the septum. The ridges always follow the upper border of the vomer, beginning well down in the region of the nasal orifice, and extend backward and obliquely upward. The ridges are sometimes more developed in their forward part, but more frequently in the deeper part; rarely is there a circumscribed thickening in the form of a spur.

Marked ridge formation is frequently associated with pronounced deviations, seldom, however, does it appear upon the concave side. Pronounced acute-angled deviations are, as a rule, of traumatic origin.

I have always observed that the ridges caused by disturbances in growth possess a cartilaginous covering, which is a continuation of the septum cartilage and extends from it backward in the region of the completely bony septum to the extreme posterior end of the ridge. There is rarely a similar covering on the concave side.

The principal part of a ridge is bone which is formed from the vomer.

It also happens that the nasal septum, especially the quadrangular cartilage, develops to an abnormal thickness. In a narrowly constructed nose such a condition deserves special consideration.

Essentially different from the alteration of the septum due to disturbances in growth, just mentioned, are those due to injury. They are always located on the forward part of the septum, that is, in the region of the cartilage. They can, however, extend more or less backward on to the bony septum. The deviation is in the form of an acute angle, because the fractured lamellae of the septum form an acute angle, pro-

ceeding from above and below. Therefore the groove runs from forward, backward.

The most anterior part of the cartilaginous septum is thereby twisted upon its vertical axis, and lies obliquely from the forward part towards the groove; its free edge projects into the free nasal orifice; its forward surface can be seen on the other side and can assist in completely closing it. On the wide side, a deep hollow like the inside of a boat is seen. The tip of the nose is deviated toward the wider side. The ridge of the nose shows a concavity above its tip. Where the fractured lamellae of the septum are pushed together, the mucous membrane is thinned and the cartilage thickened. The thickening can have grown very thick and appear as though one of the fractured pieces had been shoved over the other. I have also found, in cases operated on, multiple fractures, with the fractured pieces shoved irregularly over one another. Here and there, between the mucous membrane layers, the cartilage is completely absent.

It should be mentioned that the quadrangular cartilage is sometimes luxated from the border of the vomer and located to one side; this can also be combined with a fracture.

Further, traumatic deformities can occur in combination with those dependent upon disturbance in growth.

There is still another kind, or modification, of septum deformity, of the most varied origin, which must sometimes be subjected to the submucous resection, and which I will designate as rhinologic. It is the after-result of the frequent method of treating with electrolysis, galvanocautery, knives, chisels, and saws of numberless varieties. After the use of any of these methods there still remains, as a rule, a considerable deformity, or there is a hole as the result of the above endeavors.

In such failures the surgeon often has a very difficult task before him because the cartilage of the septum is here and there absent, the mucous membrane is very much thinned, the perichondria of the two sides have grown together, and under certain circumstances there will be synechia between the septum and the opposite lower turbinate.

The existence of changes as described above are, in many cases, not sufficient ground for an operative procedure. It is then advisable to operate only when the alteration is of a high degree or for cosmetic consideration. We

undertake a correction for disturbances caused through alteration of the septum, provided they are of such a degree as to warrant surgical interference.

The principal disturbances to be considered are of a respiratory character, and I need not go any further into this great chapter of rhinology than to mention, that we are often confronted with the question whether we shall partially or completely remove the inferior turbinate, together with its bone, or perform a septum operation. The first is for both the surgeon and patient by far the quicker and easier. One must, however, bear in mind that an extensive physiologic mucous membrane surface is permanently destroyed, and there is allowed to exist an unequal width between the two sides of the nose. I will not enter farther into the subject than to say that, regarding the total resection of the inferior turbinate, so much can be done, that evil results will last for the remainder of life. I believe it is more correct to cut away with the scissors only the swollen and hypertrophied mucous membrane of the inferior turbinate, and then to operate on the septum and bring it to its normal median position. The mucous membrane of the inferior turbinate will so far regenerate that it can fulfill its respiratory function nearly as well as normally. Thus, if one will treat in accordance with my suggestions, the respiratory mucous membrane of the nose will remain as near normal as though not interfered with, and the therapeutic result must be corresponding.

Besides the disturbance to respiration, there can also be other conditions making an operative correction of the septum deformity advisable. I refer to the growth of polypi, and to chronic affections of the nasal sinuses. It is well known that such conditions are especially persistent in a narrow nose, and that the making of a diagnosis and the carrying out of the treatment is very difficult. It may be impossible to help the patient until the deformed septum has been corrected. I have also made use of the operation under consideration for chronic bronchial catarrh, and for reflex neuroses of different kinds.

In ozena, with a narrow nasal cavity on one side, it is well to try to make the narrow side wider and thus the wide side narrower.

With the indications for this operation, I will contrast the contraindications.

The submucous resection of the septum can be both tem-

porarily and permanently contraindicated. The latter applies to people of advanced age, unless there be important reasons for interference. Such patients have lived their whole life with faulty nasal breathing, and surgical interference in the nose is not in general borne as well as in younger individuals.

Small children are also not good subjects for such an operation, as their nasal proportions are small and the narcosis is not so satisfactory. Besides we have had no experience with such, as the disturbances from growth occur later. From twelve years on, the submucous resection of the septum can generally be performed.

This operation is also contraindicated on patients suffering with different chronic constitutional diseases. In pulmonary tuberculosis, one should operate only during the early stages, and then only on those who are well nourished, and who have a well-grounded prospect of a standstill or healing of their disease. The restoration of a free nasal breathing is often of the greatest value to such. If there already exists good nasal breathing in patients with diseased lungs, they should be sent to a sanatorium for the "air cure."

I never operate on cases with temporarily healed nasal lupus, because of the danger of a recurrence and the extension of the lupus process.

The operation is temporarily contraindicated on all patients with an acute process in the region of the nose. I would especially caution against operating on a patient who is suffering with an acute rhinitis, for besides the local bad effect there is a possibility of more distant trouble, as an inflammation of the throat and middle ear.

In cases with chronic catarrh of the nose and sinuses, where the secretion is essentially mucous, the operation can be undertaken without fear.

If there exists a decided purulent secretion, it is best to put off the operation until there is a marked improvement, unless urgent reasons for operating are present.

I always do any necessary operation on the turbinates after the septum resection, instead of before, as the wound of the turbinate will remain purulent for a long time.

Fresh injuries of the septum should first be allowed to heal. One can wait a year if necessary.

Patients suffering with tertiary syphilitic lesions in the nose,

must not be operated on until healing has taken place, and a long time has elapsed without recurrence.

TECHNIC OF THE OPERATION.

Because of my extensive experience I am in a position to give a complete description of the undertaking of the submucous window resection of the nasal septum. Each one of my statements has been carefully considered and proven to be of practical value. The procedure will not in the hands of everybody be perfectly successful from the beginning. One must possess ample skill in the ordinary rhinological work, and should especially make himself thoroughly familiar with the different steps of this operation.

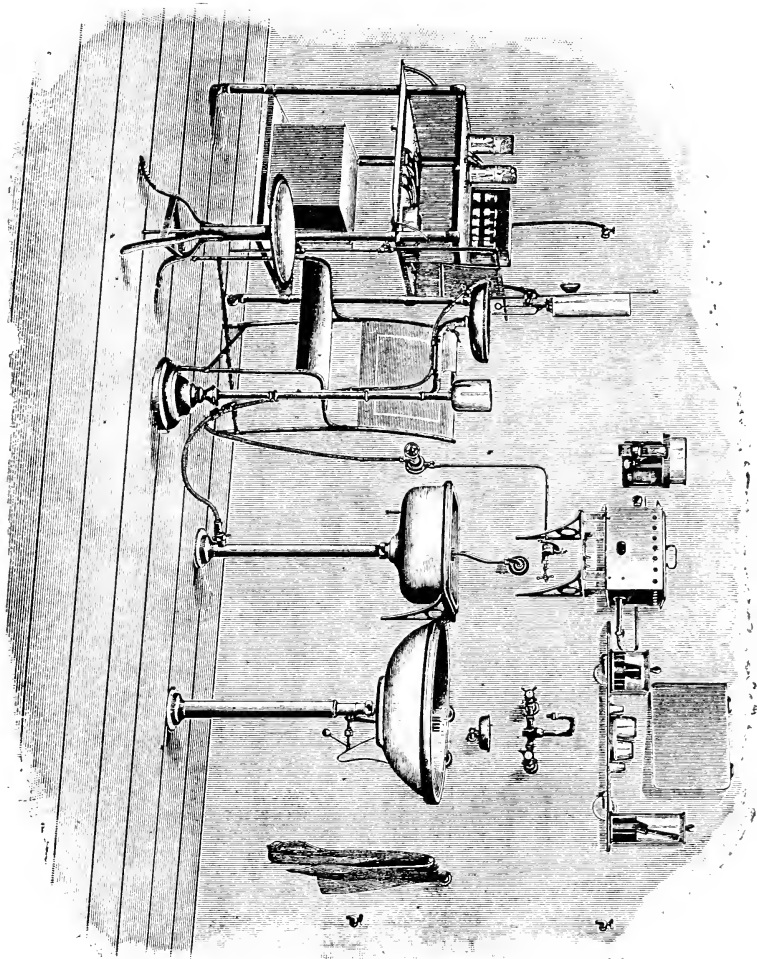
On account of the necessity of a perfectly aseptic technic, the operation is somewhat complicated. Much time can be saved by having assistants who can make the necessary preparations, and who thoroughly understand the operation.

PREPARATION.

The submucous resection of the nasal septum requires thorough asepsis, and those who do not adhere closely to it, will occasionally experience infection. The patient will have pain soon after the operation, the nose will swell, and there will be a rise of temperature. Between the two mucous membrane layers of the septum, a sero-sanguinous fluid or pus will accumulate. Relief from the above mentioned symptoms can easily be obtained by letting out the exudate through the operation incision, but healing, on account of the infection, is retarded from 8 to 14 days, and what we have said in praise of the great advantage of the submucous resection method, the rapid healing, will, through such failures in the asepsis, appear fallacious.

We strictly follow the rules of asepsis as laid down by the general surgeon. The operation should, if possible, be performed in a room that is easily cleaned, like a surgical operating room. All that is to come in contact with the patient and operator must be sterile. It is best not to treat purulent and infectious conditions in the same place where aseptic operations are to be performed.

FIG. 1. Aseptic operating room in the laryngo-rhinologic clinic in the University of Freiburg i Br.



CLEANING THE FIELD OF OPERATION.

Have the patient wash his face and the nasal orifices with soap and water. Then the nasal vestibules, the outside of the nose and surrounding parts should be washed off, by the surgeon or his assistant, with a weak solution of sublimate.

The inside of the nose usually requires no special disinfection, because as a rule, there exists no virulent bacteria therein. This, of course, applies only to the nares in which there is no acute or chronic inflammation. In case there be indications for a submucous resection in a nose so inflamed, one can try to wash away the virulent bacteria by syringing the nose with a weak antiseptic solution.

The patient should be covered with a sterile cloth, large enough to protect his hands, and should be cautioned not to touch the cleaned area. The head is covered with a sterile cloth or rubber cap, so that the operator's hands will not become infected during the operation by placing them on the hair of the patient's head.

The operator, the assistant and the nurse, who holds the head of the patient, must thoroughly clean their hands before the operation.

It is advisable not to treat infected patients before the operation, thus avoiding contaminating the hands with infectious material.

We clean our hands after the procedure of C. Haegler, which he has so logically founded and described in his well-known and excellent book "Haendereinigung, Haendedesinfektion und Haendeschutz." The hands are covered with bolus alba and enough water to form a paste. The paste is well rubbed into the skin, this removes the fatty substance. The hands are now washed with soft-soap, water and brush. Haegler lays the greatest value upon the rubbing of the hands with a rough sterile towel. After a thorough rubbing the hands are rinsed with 96 per cent alcohol, and finally with sublimate 1:10,000.

INSTRUMENTS.

All necessary instruments are sterilized by boiling in a 2 per cent solution of bicarbonate of soda immediately before the operation. It is best to have a separate set of instruments for the submucous resection of the septum, and under no cir-

circumstances should they be used in the treatment of purulent processes.

After the instruments have been sterilized, they are laid out upon a sterile glass plate or towel. The vessels to be used during the operation should also be made sterile. The bottles, which hold the necessary drugs, should be cleaned with an antiseptic solution. Of late we use sterilized metal clamps, which fit around the bottle in such a way that the operator's hands need not come in contact with the bottle (Fig. 2).



Fig. 2. Holder for the cocain bottle.

We use, of course, sterilized sponges and cotton. The latter is in the form of a roll, kept in a specially constructed case, and sterilized while in the case by placing the case in a steam sterilizer.

The powder blower, before using, is covered with sterile gauze. The head-mirror must be disinfected. I am using head-mirrors, the mirrors of which are cemented into metal holders. The head-band is of hard rubber.

Excellent local anesthesia can be produced by submucous injections of a $\frac{1}{2}$ per cent solution of cocain with the addition of a little adrenalin, (Braun).

ANESTHESIA.

We use 2 c.c of a $\frac{1}{2}$ per cent cocain solution, and to it we add 4 drops of a solution of suprarenium hydrochloricum in physiologic salt solution 1:1000. (Farbwerke, Höchst a/M.)

The place to be injected is first anesthetized by applying to it a little of a 20 per cent cocain solution. This place is on the anterior lower part of the septum, near the boundary between the vestibule and the principal cavity of the nose (Limen).

The injections are to be made on both sides of the septum, principally in the region of the forward end of the vomer and

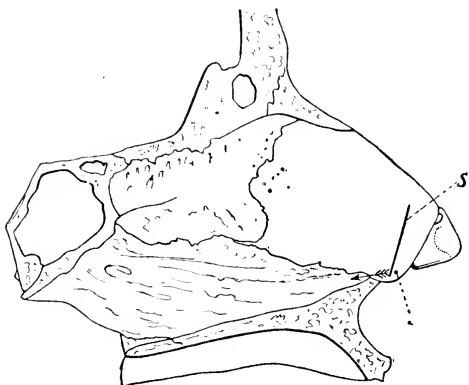


Fig. 3. Nasal Septum.—J. Location of the subperichondrial injection of cocain-adrenalin. S. Incision in the mucous membrane for the submucous window-resection.

the place for the incision. We use for this purpose a sterilized Pravaz's syringe, with a very sharp needle about twice as long as an ordinary needle. The syringe is filled and the needle firmly screwed on, with the oblique surface of the needle facing the septum. The needle is pushed through the mucous membrane to the cartilage, so that the fluid forced out of the syringe will separate the perichondrium from the chondrium. If one succeeds in doing this, the mucous membrane over the point of injection will become pale and bulge out. As more fluid is injected it will, in the majority of cases, spread out and continue to elevate the perichondrium. The

bulging will grow larger at its circumference, but principally in a backward direction. In such a way a large part of the septum can be anesthetized.

In addition to the anesthesia, the tendency to bleeding is in this way greatly decreased. The mopping up of blood is thus less frequently necessary, and the operation can be completed more easily and quickly.

It may be well to state that we inject one cubic centimeter of the above mentioned mixture into each side of the septum. The injection is not easy and must be practiced.

The use of the ordinary nasal specula makes it difficult to examine the relative parts of the septum, and interferes with the placing of the needle of the syringe. I, therefore, as a rule, pull the ala nasi outward with a simple retractor (Fig. 4)



Fig. 4. Hook for lifting the alae nasi.

which can be attended to by the nurse who holds the patient's head.

It is best to make the injections slowly. As a general thing, directly after the injections there occurs palpitation of the heart, which usually disturbs anxious and nervous persons, but which quickly passes away. If it seems desirable a swallow of brandy may be given.

Fifteen minutes must intervene from the time of making the injections until the beginning of the operation, so that the injected fluid will have sufficient time to work. It is best, directly before the beginning of the operation, to carefully paint the whole of the mucous membrane of both sides of the septum, especially in the upper posterior region, with a 20 per cent cocaine solution. Thus can one feel sure that the patient will not experience any pain during the whole of the operation.

OPERATION.

The patient sits erect on a chair; a nurse stands behind and holds the head of the patient facing the operator, who is seated on a stool so adjusted that he can easily see in a horizontal direction into the nose to be operated upon. At the operator's right is the instrument table, with all the necessary instruments conveniently arranged; at his left is another table, with a sterile cover, so that he can easily lay down instruments and things on either side.

Close by is a stool with a vessel containing a weak solution of sublimate, in which the hands and instruments can occasionally be rinsed, also a sterile towel should be convenient.

The assistant sits on a stool behind the operator, in such a position that he can follow the progress of the operation by looking past the operator's right ear. I would like to remark here, that one can, on account of the small amount of bleeding (as a result of the injection of adrenalin-cocain) dispense with an assistant, but it is very convenient and shortens the duration of the operation, if there is somebody at hand who can at the right moment mop up what little blood there is.

Only for a short time, when the chisel is being used, is it hard to dispense with the help of an assistant.

(a)—INCISION OF THE MUCOUS MEMBRANE.

On which side shall we make this incision?

It can be made either on the concave or convex side. I choose as a rule the convex, because here the mucous membrane is thinner and easier to injure than upon the concave side. Working from the concave side, it is much more difficult, and indeed sometimes impossible, to elevate the opposite mucous layer without perforation.

We nearly always operate on the convex side, i. e., sometimes right and sometimes left, therefore, one must practice using the knife and elevator with the left hand, until it is as skilled as the right.

I make the cut through the mucous membrane of the septum with an ordinary small-bellied blade scalpel. In making the incision I have the ala nasi pulled out and a little up with a retractor, and place the little finger of the hand not holding the knife, in the other nasal orifice so far that I can feel the knife as it cuts into the septum. In so doing, one avoids the complete cutting through the latter. Great care must be used

in regulating the pressure on the knife with the sharpness of its blade. The incision should always be made from below upward, i e., from the floor of the nose toward the tip. If made in the opposite direction the blood will flow over the field of operation and obstruct the view. The line of incision runs from behind and below, upwards and forwards.

The operation is easier if the incision is made well forward, but I consider it of great value to leave a part of the forward end of the cartilaginous septum to act as a support to the outer nose. My incision is made, for that reason, about half a centimeter back of the movable edge of the septum, not parallel to it, but a little oblique. The upper end is one centimeter or more further back than the edge of the cartilage. (Fig. 3 S.)

Only when the forward part of the cartilaginous septum deviates from the middle line, or is pushed over to one side, do I begin the resection from the edge of the cartilage, as Hajek does in all cases. This is best done by pushing the movable noncartilaginous part of the septum to the side opposite the deviating cartilage edge, and then cutting upon the aforesaid edge.

It will be easily seen that the first part of the operation under such circumstances is more easily accomplished, for the perforation of the cartilage with injury to the mucous membrane of the opposite side, which beginners frequently experience, is lacking.

The first cut should pass completely through the mucous membrane and a little way into the cartilage. If this is not done, then other cuts should be made until the incision does extend completely through the mucous membrane. The perichondrium of this side must not, under any circumstances, remain intact, and when the edges of the incision are separated, the bare cartilage should come into view, for only between the perichondrium and chondrium can the mucous membrane be easily separated from the latter.

In order to be sure that the cartilage is absolutely free, I always scrape over the surface with a sharp elevator. The elevation of the mucous membrane of the incised side can now be undertaken. I begin this elevation by first carefully dissecting the mucous membrane from the cartilage for a distance of about $\frac{1}{2}$ centimeter with the sharp elevator (Fig. 5a and 6), then in this narrow undermined place I put

the blunt elevator (Fig. 6), with which the mucous membrane can quite easily be elevated backward, upward and downward, from the cartilage and bone. The best way to avoid an injury to the mucous membrane is to look into the side of the nose being operated upon, and control the progress of the elevator by watching its movements, which can be seen through the mucous membrane. The elevation should extend as far

Fig. 5.

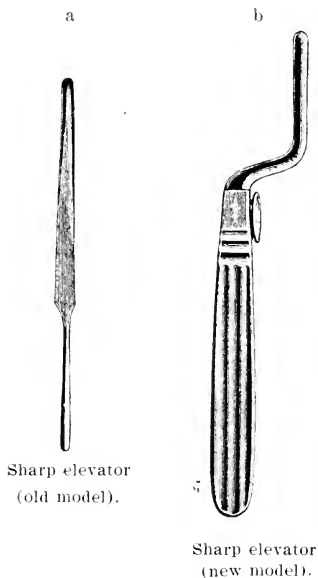


Fig. 6.



as possible backward and upward (Fig. 7, A). It is difficult to pass downward over the crest of a ridge before the cartilage has been resected, as the mucous membrane is thinnest at this place and easily torn; but if the ridge becomes flatter as it extends backward which is usual the case, it is, with care, quite often easy at this place to pass downward over the crest without injury to the over-lying membrane.

The deviations and ridges on the forward part of the septum are as a rule, so markedly bent and coming so near the floor of the nose, that it is nearly impossible to elevate the membrane from around and under them until the cartilage and bone has been resected.

It is especially difficult to elevate the mucous membrane from the sharp angle of a traumatic deviation of the quadrangular cartilage, and he who tries to do so will perforate it as a rule.

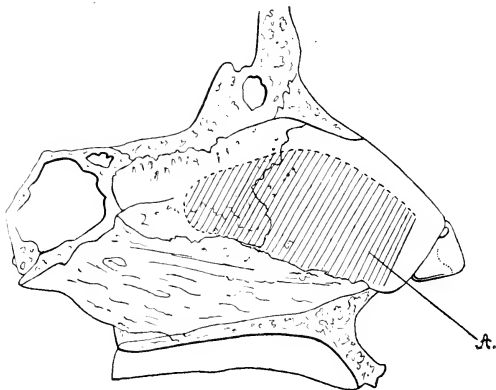


Fig. 7. Nasal Septum.—A. Area of detachment of mucous membrane from septum (shaded).

Thus, one should advance only to the edge of the ridge and not attempt to elevate the remaining mucous membrane until the cartilage has been resected to this place. When such a resection has been completed, the remaining deviating part can always be pressed to the opposite side, and the freeing of the mucous membrane is quite easily accomplished.

Another difficulty is when the traumatic deviation is so great that the convex side of the nose is markedly narrowed or completely closed, but with patience and skill this can be easily overcome. The difficulties of this operation, as have been described, are met with on the forward part of the septum, indeed in many cases confined largely to the cartilage. The reason for this is that the deviations as a rule gradually diminish toward the deeper located part.

(b)—THE INCISION OF THE CARTILAGE.

In order to elevate the mucous membrane from the concave side, one must cut through the cartilage in the vicinity of the mucous incision, but in doing so great care must be used to

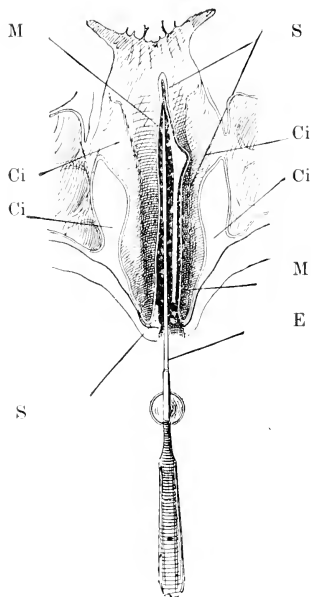


Fig. 8. Horizontal section through nose, 1.5 cm. above floor of nose.

Schematic representation of the detachment of the mucous membrane, the instrument entering the incision and passing through the quadrangular cartilage to the other side of the septum.

Ci, lower turbinal; S, bone and cartilage of septum; M, mucous membrane; E, blunt elevator.

avoid injuring the mucous membrane of the opposite side. I advise, in this manœuvre, to again place the little finger of the free hand in the opposite nostril, then with the sharp ele-

vator, under careful control of the afore-mentioned finger, the perforation of the cartilage can be accomplished. One begins at the upper part of the mucous membrane incision, places the sharp elevator against the cartilage, scratches with it in a line with the said incision, and slowly seeks to pass through. The instrument is not placed at a right angle with the surface of the cartilage, but on the contrary at an oblique angle, and the farther one goes through the cartilage the more it is pressed toward the concave side. Always have in mind, however, the approach to the delicate mucous membrane of the opposite side. When a small opening has been made through the cartilage, the sharp elevator will easily pass downward through the underlying cartilage, in a direction parallel with the mucous incision. The perforation of the opposite mucous membrane is thus easily avoided. This procedure is made much simpler if the first incision through the mucous membrane has been carried into, or nearly through, the cartilage.

(c)—THE ELEVATION OF THE MUCOUS MEMBRANE OF THE OPPOSITE SIDE.

As soon as the cartilage is perforated and the opposite mucous membrane has been elevated a little with the sharp elevator, the blunt elevator is brought into use. It is used in about the same way as before described, except being pushed in between the cartilage and the mucous membrane of the opposite side. It should always be kept tightly held against the cartilage, and its movements watched through the mucous membrane, which can easily be seen by looking into the nasal cavity of this side with the aid of a speculum.

In such a way the mucous membrane can easily be elevated as far as the septum is deformed, and indeed as well in the region of the quadrangular cartilage as in the region of the vomer, with the exception of its extreme anterior end. The mucous membrane can also be lifted out of deep concavities, if one will work backward always under the perichondrium.

Only in deep grooves is there much difficulty experienced. Here it is advisable not to attempt to elevate the mucous membrane until a large piece of the cartilage has been resected.

When we have loosened the mucous membrane to a large extent from both sides of the septum, we can begin the actual resection.

RESECTION.

(a)—CARTILAGE.

The actual resection is done by separating the two elevated mucous layers with the use of my nasal specula: one blade passes through the cartilaginous incision, while the other is placed beneath the membrane first elevated. This leaves the septum between the two blades and the two mucous layers on the outside. I use from the smallest to the largest of the specula that I devised for the examination of the middle and back part of the nasal cavity (*rhinoscopia media*). (Fig. 9.) In using these specula one makes a central cavity in which one can easily work. (Fig. 10.)

Generally I have removed the cartilage with Hartmann's forceps and the corn-forceps. I nip away from the septum, with Hartmann's forceps, a groove above and one below, and then twist away the interlying cartilage with the corn-forceps. Of late I have been using a cartilage knife that I constructed for this special purpose.

It has the shape of a fork. (Fig. 11.) The separation of the two prongs corresponds to the thickness of the cartilaginous septum, so that the cartilage can pass between them. Near the end of the instrument there is a knife transversely fixed between the prongs. In using this instrument the knife is placed against the forward edge of the cartilage, with the two slightly projecting prongs at either side, and pressed backward. It cuts through smoothly without slipping to right or left, and has in my hands accomplished its purpose excellently.

The first cut to be made with this knife is through the upper part of the cartilage to be resected, then through the lower part, in a linear direction from before backward, and the intervening piece is removed with the corn-forceps. The remaining cartilaginous defect is removed as far as necessary with Hartmann's forceps. (Fig. 13.) Then as a rule I remove the thin forward part of the lamina perpendicularis. (Fig. 12-1.)

One can first remove the bottom part of the cartilaginous septum. (Fig. 12-2.) This is firmly united to the vomer and covers a possible existing cartilage ridge

With my sharp elevator I now free the cartilage of its covering, from the entrance of the nose to the forward end of the vomer, and separate it from the latter, which is easy to do,



Fig. 9. Author's nasal specula, one-half natural size.

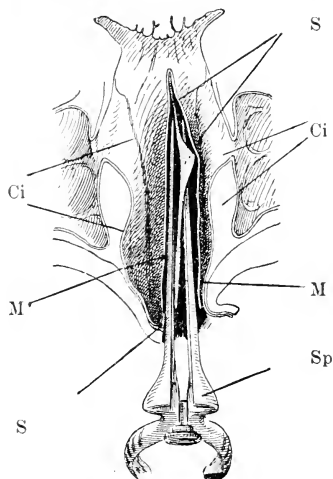


Fig. 10. Horizontal section through nose, 1.5 cm. above floor. Schematic representation showing how the mucous membrane of both sides is held away from septum. Ci, inferior turbinal; S, septum; M, mucous membrane; Sp, my long sepculum, grasping the septum. The left blade passes through the incision in the quadrangular cartilage on the right side of septum.

and one can simultaneously free the border of the vomer quite far back from its cartilaginous covering. The strip of cartilage thus loosened is removed with forceps.



Fig. 11. My new septal-cartilage knife, cutting from before backwards.

(b)—BONE.

I have already spoken of the resection of the posterior superior deviating part of the septum, which sometimes forms a ridge.

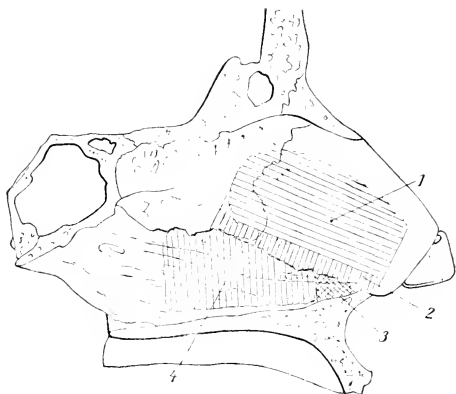


Fig. 12. Nasal Septum.—Schematic representation showing in what order the different parts of the septum are cut. (1) First area: part of the cartilago quad. and lamina perpendic. (2) Second area: lower part of cartilago quad. and lamina perpendic, where they border on the vomer. (3) Third area: anterior inferior end of vomer (anterior area vomer triangle). (4) Fourth area: vomer (amount to be removed).

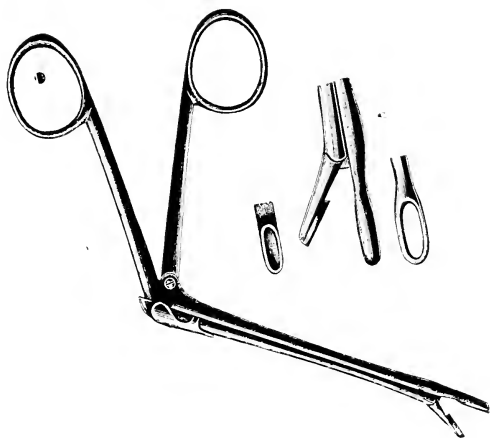


Fig. 13. Hartmann's nasal forceps.

Before one goes any further he must be sure that the mucous membrane of both sides is far enough elevated backward and upward. As a rule, there is a little to be elevated which can be done with the blunt elevator.

At this point of the resection the use of my largest speculum for rhinoscopia media is of the greatest value. The two membrane layers can easily be held apart and thus protected from injury. (Fig. 10.) The resection is done with Hartmann's forceps, except the forward end of the vomer (Fig. 12-3), which requires a special technic.

Formerly I spent much time trying to remove this generally rather thick bone with the bone forceps. Ridges having their direction along the border of the vomer begin here, that is, the anterior point of the vomer, and are often located far down near the floor of the nose.

The bone is usually so thick that it limits the field of operation, and makes it difficult to get at this bone with strong



Fig. 14. My septal chisel, for removal of anterior vomer triangle (area 3 in Fig. 11).

enough forceps. I, therefore, use the chisel in the following way:—

One must know that the forward end of the vomer has a special periosteal covering.

After the removal of the cartilage, which rests upon this periosteal covering, the periosteum must be severed and separated from the bone. If it is very thick, I cut it with a scalpel, and carefully separate it from the bone with a sharp elevator. (Fig. 5 a.)

The periosteum is separated from the upper surface of the vomer downward to its most forward end, and then freed laterally, right and left. Great care must be used not to perforate the mucous membrane of the concave side.

Generally one cannot go very far back on the side of the operation, because the space between the ridge and the nasal floor is so narrow. One must be contented therefore with a partial separation, as it is enough to have the forward triangle of the vomer laid free. (Fig. 12-3.)

Now we come to the use of the chisel. I have constructed a bayonet-like instrument that I have used for a long time with the best of results. (Fig. 14.) The bayonet-like bend is made in such a way that the chisel itself is about three centimeters higher than the handle. Thus one can easily see over the fingers holding the instrument by its handle. The cutting part of the chisel is now placed on the lowest forward end of the vomer, on a level with the nasal floor. (Fig. 15.) In order to hold the nasal speculum with one hand and to control the chisel with

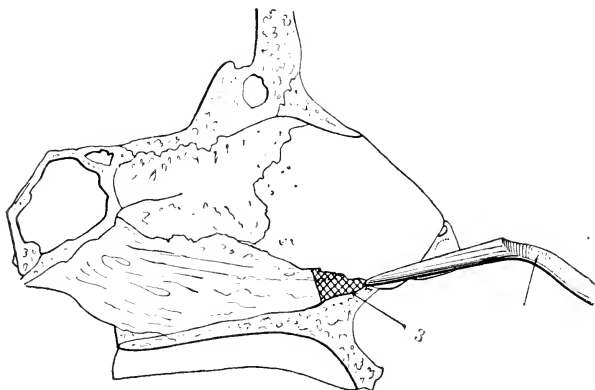


Fig. 15. Schematic representation of chiselling of anterior vomer triangle (3). M. Chisel.

the other, so as to avoid injury of any of the neighboring tissues, the assistant must use the hammer. The assistant should receive continual instructions from the operator as to the way he shall strike. The strokes must all be given with an elastic swing. Heavy, careless blows do not accomplish much, and they jar the patient's head in an unnecessary way.

Formerly, this part of the operation was made difficult through severe hemorrhage. Even a small artery in the bone can spurt so vigorously that compresses must be applied for a long time in order to stop the hemorrhage sufficiently to continue with the operation.

After the appropriate use of adrenalin-cocain injections,

with which I seek to directly hit this place, I experience very little trouble from hemorrhage.

When the base of the forward wedge-shaped part of the vomer has been chiseled through, it is detached with the chisel, then the most difficult part of the operation is over.

It is now only a question of separating the mucous membrane, right and left, from the vomer down to the nasal floor by the use of the blunt elevator.

On the side with the ridge or knee-like traumatic deviation, one tries to pass under it with a blunt elevator, which is, as a rule, possible, because the ridges all slant from the lower for-

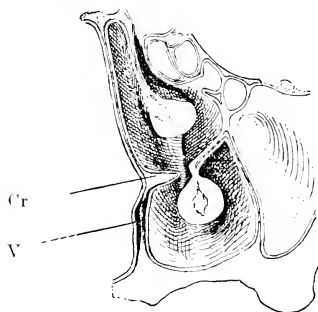


Fig. 16. Frontal section through an accessory sinus. A ridge, Cr, on septum; V, vomer; very thin under the ridge.

ward part backward in an upward direction, along the ascending edge of the vomer.

Traumatic deviations also often have a similar position. When the forward part of the vomer has been removed with the chisel, there will then always be a space between the ridge and the floor of the nose. (Fig. 16.) The vomer below a deviation or ridge, is always very thin. (Fig. 16-V.)

When one has elevated the mucous membrane from both sides of the lower part of the septum (Fig. 12-4), and has also freed the ridge as far as possible from its mucous covering, it is then advisable to cut away, with Hartmann's forceps, the thin vomer beneath the ridge.

The ridge is now above and below without connection with the adjoining septum, and it can, therefore, be quite easily extracted with a strong bone forceps. (Fig. 12-4.) The

remaining part of the ridge and deviation can be removed with Hartmann's forceps. The space between the two mucous layers should now be cleaned of blood, pieces of septum, etc., and the two layers placed one against the other, then both sides should be examined to see if the septum is now completely in a straight line. Usually a little has to be removed from the upper rim of the resected window. Every point of the septum projecting beyond the median line must be removed, so that after healing has taken place the mucous membrane will stretch in an even surface from the edges of the window resected from the septum. If the edges of this window do not occupy the median line, of course the future septum will not occupy the median line.

I always advise not to take away too much in the direction of the ridge of the nose, so that the ridge will not later sink in and produce an external deformity. When I am operating in this region I press from time to time upon the ridge of the nose, to make sure that it still possesses enough power of resistance and elasticity.

CLEANING AND CARE OF THE WOUND.

After the completion of the operation, the longest of my nasal specula is placed between the two lamellae of the septum and again the blood is carefully wiped out; any pieces of bone or cartilage that may be present are removed, and a little viform is blown in. The speculum is removed and the mucous layers are smoothly laid one against the other, while looking first into one nares, then the other. The mucous membrane that was incised is seized with a forceps at its edge and put in its proper place, especially when it has been stretched a little or injured. The edges of the mucous incision should be brought close to one another, so that suturing will be unnecessary.

If a suture appears necessary it can be done in the following way:— When the wound is located well forward, it can be sutured in the usual way with a short, thin needle. If this is not the case, one needs a needle bent like a retractor, which I have had made for this purpose. (Fig. 17.) The eye of this needle is just behind its point. After the needle has been threaded, it is placed in the nose, first passed through the

posterior edge then the anterior edge of the mucous membrane incision. To accomplish this the mucous membrane must be held with a pair of forceps. After the needle has been passed through both edges of the incision, it must not be withdrawn until the suture is seized with a small hook (Fig. 18) at the point of the needle, and held fast. The needle is then pushed backward and removed from the nose, thus leaving the suture looped



Fig. 17. Needle for suturing
mucous membrane.

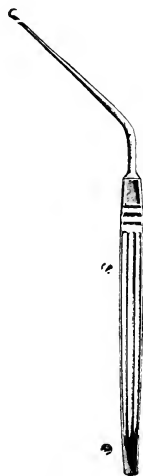


Fig. 18. Hook to draw the silk
threads from the eye of the
needle.

about the hook. The short end of the suture can now be pulled forward and out with the removal of the hook. The knot cannot be completely tied with the fingers, but must be aided with the use of a pair of forceps, which makes it possible to tie a knot deeply located within the nose.

At present I do not, as a rule, make use of the sutures, and advise their use only when there has occurred perforations of the mucous membranes, located directly opposite one another. These perforations usually occur only in a case operated by an

assistant or others who have not had sufficient training and experience.

The sutures are always indicated when a perforation, due to other operative endeavors should be closed.

PACKING THE NOSE.

I consider it absolutely necessary to keep the two layers of mucous membrane in place after they have been exactly opposed, by the use of tampons. It is not necessary, however, to make the packing especially firm.

At first a tampon is pushed into the side not operated upon, then another. I then place my longest speculum in the other side, and with it I hold the mucous membrane in place, while I am putting in the tampons. Usually two or three are necessary.

By pressing upward or downward, also lightly pulling on the tampons, the position of the mucous membrane can be made perfect.

The outside of the nose is compressed a little and put in its correct position. Any protruding packing is cut off. The patient is cleaned and put in bed.

THE COURSE AND AFTER-TREATMENT.

I allow the packing to remain for two days, then remove it very carefully, especially from the side operated upon, so as not to tear apart the wound. This can be best accomplished by carefully loosening the cotton from the mucous membrane, and pull it out over a speculum. If the incision gapes a little, on the following day it will be seen covered with a crust. If this be troublesome, I allow the patient to stop up that side of the nose with cotton and return occasionally to have crust removed and the area painted with nitrate of silver. Usually after removing the packing there is no necessity for further treatment.

After the operation the patient is bothered only with the packing in the nose, no pain should appear. The temperature in uncomplicated cases may rise to 37.5° C. (99.5° F.) or more.

On removal of the packing one has the pleasure of seeing before him a straight septum covered with normal mucous

membrane. The small incision is scarcely perceptible. One can hardly believe that from so extensive an interference, in only two days there is almost nothing to be seen.

If the septum be not exactly in the middle, which can occur through unequal packing of the nasal cavities, it can be put in the right position by placing in the narrower nasal cavity a tampon to remain for a day or two. Even later, such a failure can be corrected in the same manner.

The patient can be discharged after a day or two, but should have his attention called to the importance of care of the external nose, so that the union will not be destroyed by carelessness.

As the external nose is very elastic it can withstand a moderate trauma without damage.

In cases which I have examined after some time had elapsed, I find that the septum has acquired quite an amount of resistance. It thus appears to be correct, what other writers have already maintained, that reformation of bone and cartilage takes place from the perichondrium and periosteum.

The equal width of both nasal cavities brings about a great relief to the patient's breathing, which formerly had to be done principally through one side. The less the resistance within the nose, so much less is inspiratory force required to draw the air through the nose.

In cases with unequally wide nasal cavities, breathing will take place only through the wider side, unless inspiration is forced. With equally wide nasal orifices and with equal resistance within the two nasal cavities, the complete respiratory act will be performed with the least effort.

One sees in patients with deviation of the septum, particularly if they have a long, narrow and often thin nose, the alae nasi quite close to the septum and easily drawn still closer. This condition needs to be corrected. If the septum be in a normal position and other interferences to breathing have been removed, especially thickening of the mucous membrane of the turbinates, I then recommend to the patient the strengthening of his alae nasi through exercise of the muscular structure. More is accomplished by this method than by any kind of mechanical assistance. The muscles of this part of the nose must be actively exercised each day. The patient can begin by standing before a mirror and watch the movements of the

alae. Gradually the muscles become so strong that the alae nasi will occupy a normal position.

RECAPITULATION.

The essential feature in the technic of my window resection of the nasal septum is that I make, by means of my long specula, a median space between the two mucous membrane layers of the septum, in which I can as easily operate as in the inside of either nasal cavity. The entrance to this space is the incision, which becomes rectangular in shape through the use of the speculum.

All the other parts of the operation group themselves about this fundamental idea.

The experienced operator can very rapidly elevate the mucous membrane from the cartilage and bone, also at the time of actual resection can remove large pieces. The length of the incision determines this, however. I can perform the whole operation on an average of twenty minutes.

On account of the great increase in indications for the septum operation, which we have learned in my clinic during the past few years, this operation has with us become a frequent and established undertaking.

Our rhinologic knowledge has gained a great deal through this operation, especially in ability to perform and in exactness. Half of our unnecessary rules have disappeared and we attain in the most elegant way and in the shortest time, what was earlier, after a long endeavor, often only unsatisfactorily accomplished. I have never had more enjoyment from any other small rhinologic operation than from the described septum operation and can most enthusiastically recommend it.

XXIV.

THE SUBMUCOUS RESECTION OF THE NASAL SEPTUM. A NEW TECHNIC WITH THE AUTHOR'S SWIVEL KNIFE, REDUCING THE AVERAGE TIME OF THE OPERATION SEVERAL MINUTES.

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CHICAGO, ILL.

The object of this paper is to describe, as concisely as possible, the technic of the submucous correction of septal malformations, as performed by me. The use of my swivel knife enables me to perform the operation in from five to twenty minutes, including the removal of the bony as well as the cartilaginous deviations. With the swivel knife the cartilaginous septum may be removed in a few seconds, rarely requiring more than from five to thirty seconds, thus leaving the operator the balance of the time for the preliminary incision, the elevation of the mucoperichondrium, and the removal of the bony malformations. In one case a complete operation was performed in four minutes, including the removal of the cartilaginous deviation and a bony ridge one and one-half inch in length. In another similar case five minutes were required.

My purpose in calling attention to the time element is to correct the prevailing idea that the submucous resection of the nasal septum is necessarily a difficult and prolonged procedure. I do not say that by my method every case can be operated upon within the limits heretofore mentioned, for there are cases requiring a longer time. After a reasonable experience, it seems probable that in the great majority the operation need not require more than ten minutes. Killian claims an average of twenty minutes, while Freer by his method claims an average of forty-five minutes. It is evident, therefore, that if a method of operating can be devised that will reduce the time to an average of ten minutes or even less, it should be re-

ceived with favor by both the patient and the surgeon. In addition to the time element, the one of shock incident to prolonged local anesthesia and a complicated technic, is an item of no small importance. It may be said, that, all other things being equal, the shorter the operation and the anesthesia, and the simpler the instrumentation, the less the shock and the quicker the healing.

My excuse, therefore, for presenting my method of performing the submucous operation, is the conviction that it enables the operator to do it in shorter time, with less traumatism, and shock, and, that, in many instances, healing occurs by first intention.

The Preparation of the Field. The question naturally arises, should the operation be performed while the nasal mucosa is the seat of an inflammatory process? In all acute inflammations the operation should be postponed, as to operate under such circumstances might result in infection of the wound, and lead to serious complications. In chronic inflammations, including chronic sinusitis, the operation may be undertaken if the preliminary precaution is observed of thoroughly freeing the nasal chambers of secretions by exciting outward osmosis. This not only frees the mucosa of dried secretions, but it also washes out the bacteria buried within the substance of the mucous membrane. The exosmosis is excited by tamponing the nasal chambers with gauze or cotton wool saturated with a 10 to 25% aqueous solution of ichthyol. The tampons should be left in place for from 20 to 30 minutes. The serous and mucous discharge excited by the medicated tampons loosen the encrusted secretions so that upon blowing the nose, they are ejected from it. The osmotic flow of serum also washes the bacteria from the mucosa. In purulent rhinitis and sinusitis the tampons should be introduced daily, for four or five days, in order to thoroughly free the mucous membrane of pathogenic bacteria. In non-purulent cases the nasal chambers should be thoroughly cleansed by sprays or douches, followed by swabbing with cotton-wound applicators. The face of the patient should be scrubbed and the head enwrapped with a sterile towel.

The Anesthesia. A general anesthetic may be administered although it is usually preferable to use a local one. I have performed the operation a few times under general anesthesia, finding no great difficulty except the increased hemorrhage

incidental to general anesthesia in all nasal and throat surgery. The advantages of local anesthesia are (a) the lessened hemorrhage, and (b) the greater ease of operating with the patient in the sitting position. This is a matter of considerable importance to most rhinologists, as they are more accustomed to this posture from the daily routine in examinations and treatment. I have, however, operated under general anesthesia, with the patient in Rose's position with great satisfaction. The choice of a local anesthetic depends largely upon the location of the initial incision in the nasal mucosa. If it is made in the muco-cutaneous membrane (Hajek-Menzel and White) it is advisable to use submucous infiltration as the squamous epithelium in this region prevents the absorption of the cocain. If, however, the incision is made more posteriorly (Killian) the local application of cocain may be used with good results.

The method of applying the cocain and the strength of the solution or powder, are details requiring careful consideration. I usually apply the cocain in ten to twenty per cent. solutions by means of thin gauze-like films of cotton saturated with the solution, to the entire surface of both sides of the septum. From three to four such films are required to cover each side. The film is spread over the left index finger, the bottle containing the cocain solution being held between the index finger and the thumb of the left hand, with the mouth of the bottle applied to the film-covered finger. It is then inverted until the film is thoroughly moistened. The film is then caught near its edge with a probe-pointed applicator, and carried into the nasal chamber and spread over the entire posterior portion of the septum. This is repeated until the entire surface of both sides of the septum is covered. After twenty to thirty minutes anesthesia is usually complete. In some a second application is necessary. Freer's method of applying cocain probably induces more complete anesthesia. He applies powdered cocain with a moistened cotton-wound applicator dipped into the powder. He then massages the mucous membrane with it until complete anesthesia is induced. The amount of cotton on the probe should be so small that it may be carried to the more constricted recesses of the nasal chambers. The rubbing of the powdered cocain into the mucous membrane facilitates its absorption.

Adrenalin should be used prior to the application of co-

cain to diminish the primary hemorrhage. It may be applied with a cotton-wound probe by rubbing it over the surface of the operative field, or it may be applied with thin films of cotton after the manner already described in the preceding paragraph. It does not always prevent bleeding, and predisposes to secondary hemorrhage. The dressings diminish this tendency, however, to a considerable degree.

The Position of the Patient. Each operator should decide this for himself according to his individual preference and experience. The sitting posture will undoubtedly appeal to most rhinologic surgeons on account of their greater familiarity with it, and, it seems to me, on account of the easier access to the parts. The patient is in a position where he can free the nasal chambers of blood, thereby obviating, to a considerable degree, the necessity for the frequent introduction of the probe-sponges. Each introduction of a probe-sponge or instrument subjects the mucosa to more or less traumatism. This is especially important in view of the fact that the mucosa is incised and liable to be torn by the frequent instrumentation and swabbing. For these and other reasons I prefer the sitting position.

The Armamentarium. It is desirable to do the work with the fewest instruments that will accomplish it in the best possible manner in the shortest time. A multiplicity of instruments is confusing, and causes loss of time and energy. The instruments required, will, of course, depend somewhat upon the method of operating. In a simpler method of operating, the technic is simple, and the danger of traumatism incident to the more frequent introduction of instruments is obviated. I do not mean to imply that there is necessarily excessive traumatism with a complex armamentarium, as a careful and painstaking operator will overcome this objection. I only wish to emphasize the point that a few instruments well selected, and a method of operating that obviates the need for their frequent introduction in an enclosed cavity like the nasal chambers, reduces the liability to laceration of the mucous membrane to the minimum.

The technic. The technic to be described in this article requires five special instruments, namely, one swivel knife, two elevators, one gouge, and one bone cutting forceps. In addition to these a nasal speculum, preferably the De Vilbiss wire

speculum, a mastoid mallet, cotton applicators for sponging, and a short-bladed scalpel should be at hand.

The technic described in this paper is a modification of that employed by Hajek-Menzel, White and Killian. The chief difference is in the removal of the cartilaginous portion of the septum. Heretofore this has been removed piecemeal with cutting forceps, or with knives and forceps in conjunction. By my method the cartilaginous septum is removed in one piece in a few seconds with the swivel knife designed by me in the early part of February of this year.

The swivel knife (Figure 1) is composed of two parts (a) the handle and the prongs, and (b) the stirrup blade which swings between the tips of the prongs. The prongs are placed astride the cartilage through the incision so that the

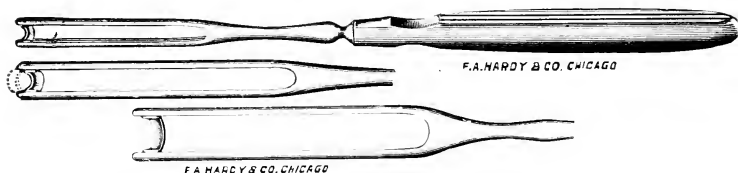


Fig. 1. The author's swivel knife is made in two parts; the handle and prongs and the swivel blade. It is only used to remove the cartilaginous portion of the septum, which it does in one piece in a few seconds. The above illustrations show the two widths of the swivel knife. The wider one is for extreme deviations of the septal cartilage.

blade cuts the cartilage as the prong-tips describe the outline of the cartilage to be removed. The swivel knife is so constructed that the resistance of the cartilage through which it is cutting keeps the cutting edge of the blade turned in the direction in which the prong-tips are moving. If the prong-tips are moving towards the posterior portion of the septum, the cutting edge is turned backward; if upward, the cutting edge is turned upward; if forward the cutting edge is turned forward; if downward the cutting edge is downward. Indeed, it is possible to cut a circular or any other shaped piece of cartilage from the nasal septum with it. With the swivel knife it is possible to remove the cartilaginous septum with one introduction of the instrument between the mucoperichondria in a few seconds, thereby reducing the time of the operation several minutes.

What has heretofore required minutes, now requires sec-

onds to do. Freer claims twenty minutes for the removal of the cartilaginous portion, whereas by my method, it can be removed in from a few seconds to one minute. More time may be required if the case is one in which the outline of the deflected cartilage necessitates careful study; or if there is extreme deviation. The time required to remove the cartilaginous portion of the septum is so startlingly short that one hesitates to state how quickly it may be done with intelligent accuracy. The swivel knife is under perfect control all the time without the aid of any mechanical device in the way of levers or set screws to control the direction of its cutting edge. Keep the prong-tips moving so as to outline the area of deflection and the resistance of the cartilage will keep the cutting edge of the blade so adjusted as to encircle the cartilaginous deflection and remove it *en masse*. As to the rest of the operation it differs in minor details, only, from the Hajek-Menzel and Killian methods.



Fig. 2. The author's mucosa knife with which the preliminary incision through the mucoperichondrium and cartilage is made. The blade is short to obviate the liability of cutting the alae of the nose.

The Incision. The object of the incision through the mucoperichondrium is to permit the elevation of the mucoperichondrium on both sides of the septum, and for the excision and removal of the cartilaginous and bony deflections or deformities of the septum. All this may be done without the loss of mucous membrane, hence healing should be very speedy. The incision chosen, therefore, should be one that facilitates the elevation of the mucoperichondrium and the removal of the framework of the septum narium with the least consumption of time, the least traumatism to the tissue, and the least shock to the patient. Freer's L-incision gives the best view of the framework of the septum, especially far back, and from this point of view it is commendable. But on account of the lack of coaptation of the edges of the flaps to the adjacent cut edges, healing is prolonged, as it heals between the edges by granulation. The Hajek-Menzel incision in the *septum mobile* at the antero-inferior margin

of the quadrilateral cartilage affords easy access to the cartilaginous septum and possesses the further advantage of beginning and ending in the muco-cutaneous tissue, which is tough and difficult to lacerate during the subsequent instrumentation. The Killian incision is curvilinear, beginning at the floor of the nose and extending forward and upward about $\frac{1}{2}$ centimeter posterior to the antero-inferior margin of the quadrangular cartilage. This incision has the advantage of opening directly in front of the anterior portion of the septal ridge. The mucoperichondrium is also more easily elevated at this point than it is more anteriorly by the Hajek-Menzel incision, where the mucocutaneous membrane is quite adherent. After all the operator should be guided by his own preferences and individual experience. The operation has been and is being done most successfully and completely through all the foregoing incisions including that of Freer. The instruments used determine to a large degree the choice of incision. With my swivel knife and Hajek's elevators and gouge there is little necessity for a complete open view of the deeper portion of the septum. The operator's sense of touch, and the contour of the septum guide him unerringly to the goal of complete removal of the obstructive deviations. Then, too, Killian's speculum rhinoscopia media may be used to separate the two mucoperichondria so as to give a clear view of the deeper bony parts. By Freer's method a clear view and an open field are essential.

Freer has done a distinct service to rhinologic surgery in perfecting his method of the window resection and his splendid results justify his method. If, however, another method easier to perform, and of shorter duration, and giving equally good results can be devised, rhinologic surgeons will be most fortunate.

The operations of Hajek-Menzel and Killian appeal to me as rational, simple, and effective, hence my endeavors have been chiefly along their lines. I often make the Killian incision on account of the ease with which the mucoperichondrium is started in its elevation, and because it obviates the necessity for the use of subperichondrial injections of Schleich's mixture.

I have used Freer's L-shaped incision in a few cases with a prominent bony ridge. The V-shaped mucoperichondrial flap is not dissected by Freer's method but by the Hajek ele-

vators. Only the perpendicular incision is made prior to the elevation of the membrane. After the membrane on the side of the ridge and perpendicular incision is elevated above the



Fig. 3. H.H. Hajek-Menzel incision. K.K. Killian incision. X.X. The swivel knife should be placed astride the cartilage at the lower X, and made to follow the outline of the vomer, perpendicular plate, and the ridge of the nose to the upper extremity of the incision K.K., or H.H. A.A. Spicules of bone upon which the swivel blade may engage. Z. Showing the right angle movement of knife to disengage it from the bone spicules. C. Cartilaginous portion of septum to be removed with the swivel knife in one piece. V. The vomer. P.P.E. Perpendicular plate of the ethmoid.

In this figure the mucoperichondrium is removed so as to show the instrument and anatomical landmarks. In operating, the mucoperichondrium is left intact, the instrument being between the membranes of the septum.

ridge, the incision is extended along the crest of the ridge. This completes Freer's incision and converts the elevated membrane on this side of the septum into a flap which is tucked into the upper part of the nasal cavity out of the way.

The cartilage is incised along the perpendicular incision and the elevation of the mucoperichondrium on the opposite or concave side is done through it as heretofore described. The cartilaginous portion of the septum is then removed with the swivel knife within a few seconds. The ridge and perpendicular plate of the ethmoid are brought into full view by this incision and are easily accessible. I am not fully prepared to recommend this incision as healing is delayed by it for several days. If, however, the ridge and perpendicular plate are not accessible by the anterior incision it may be well to extend it along the crest of the ridge.

In my description I shall refer to Killian's incision (Fig. 3, k k) unless otherwise specified. As Killian's article appears in the *Annals of Otology* simultaneously with mine I will omit a detailed description of the incision and refer the reader to his article. One point should be emphasized, namely, be sure to carry the incision through the mucous membrane and perichondrium, and a little way into the cartilage. If this is done there should be little difficulty in starting the elevation of the mucoperichondrium. If, on the contrary, the incision is not carried through the perichondrium the elevator will meet with great resistance. When such resistance is encountered, stop at once and complete the incision. My rule is to extend the incision until I can see the sharp edges of the cut cartilage when the tip of the nose is bent to one side. Under no circumstances should the incision be extended through the opposite mucous membrane, as to do so will cause a permanent perforation unless the incision on one side is closed by suture.

Where there is a sharp angular ridge coming well forward I prefer Hajek's incision (Fig. 3, H H) at the antero-inferior margin of the quadrangular cartilage as it affords better access to the bony ridge, without the danger of lacerating the mucoperichondrium. In Killian's incision the lower end corresponds to the anterior end of the crest. When the incision thus begins upon the crest of the ridge, the mucoperichondrium is easily torn during the elevation and the removal of the bony crest. By Hajek's method this unfortunate occurrence is less apt to happen as the incision is somewhat anterior to the crest, and is through tough resisting mucocutaneous membrane. When the Hajek incision is used I do not see that it makes the slightest difference on which side of the septum it is made, excepting for the convenience of

the operator. Personally I make it on the left side of the septum as I am right-handed. This leaves my left hand free to manipulate the tip of the nose during the incision. All other writers recommend that the incision be made on the side of convexity. My rule is as follows:

a. If the deflection or ridge is slight and well back I make the incision by Killian's method, on the left side of the septum, regardless of the side of convexity.

b. If the deflection or ridge is prominent and well forward I make the incision by Hajek's method, on the left side of the septum, regardless of the side of convexity.



FIG. 4. Hajek's mucoperichondrial elevators with handles adapted to the author's use. One is semi-sharp, the other blunt.



FIG. 5. This shows the semi-sharp elevator beneath the mucoperichondrium with the flat surface against the cartilage. This elevator is rarely used except to start the elevation, as its sharp end might perforate the membrane. Figure 6 illustrates the principle that should be used to elevate the mucoperichondrium, i. e., it should be lifted rather than dissected from the cartilage.

There are no objections to making the incision on the side of convexity in *all* cases, provided the operator can do so without jeopardizing the result of the operation. I think it a mistake to lay down hard and fast rules concerning this or any other step of the operation. Surgery is, after all, an individual equation rather than a formula. One can, therefore, only express his personal preference and experience, hoping thereby to stimulate others to undertake the work and to individualize it to suit their appliances and temperament.

The Elevation of the Mucoperichondrium. Hajek's semi-sharp elevator (Fig 4) should be used to start the elevation, while the dull ovoid elevator should be used to complete it.

The semi-sharp elevator is introduced into the incision of the mucous membrane, and with gentle backward pressure is moved upward and downward along the line of the incision until it loosens the anterior portion of the mucoperichondrium. (Fig. 6.)

The elevation should not be carried backward with this instrument more than one-fourth inch, as to carry it further might lacerate the mucous membrane. When therefore, the semi-sharp elevator has fairly started the elevation of the mucoperichondrium, the ovoid elevator (Fig. 6) should be introduced through the incision between the perichondrium



Fig. 6. The blunt or ovoid elevator with which the mucoperichondrium is separated after having started it with the semi-sharp one. The drawing illustrates the manner in which the perichondrium is lifted ahead of the blunt end of the elevator. The sharp instrument would constantly be liable to injure the perichondrium.

and the cartilage and pushed backward one-half inch or so, and then it should be moved upward and downward, and then backward, and up and down, until the entire operative field (Fig. 7, dotted line) has been separated. When this is done the ovoid elevator should be passed over the operative field, especially around its outer limits, so as to be sure that the mucoperichondrium is elevated at all points. Care should be exercised to elevate the membrane near the bridge and along the ridge of the nose so that the necessary amount of cartilage may be removed. Opposite the middle turbinated bodies there is often a deviation causing the middle turbinate to come in contact with the septum (Fig. 7a). The turbinated body can be made to swing outward with the pressure of the ovoid elevator through the mucoperichondrium, hence it is no hindrance to the elevation at this point.

The next step in the operation consists in completing the incision through the septal cartilage (if Killian's incision is

used). This is done with a small, short-bladed scalpel (Fig. 2). The scalpel should follow the general direction of the original incision through the mucous membrane, and should be manipulated delicately, cutting the cartilage layer by layer until the mucoperichondrium of the opposite side is reached. If the operator is inexperienced it is well for him to intro-

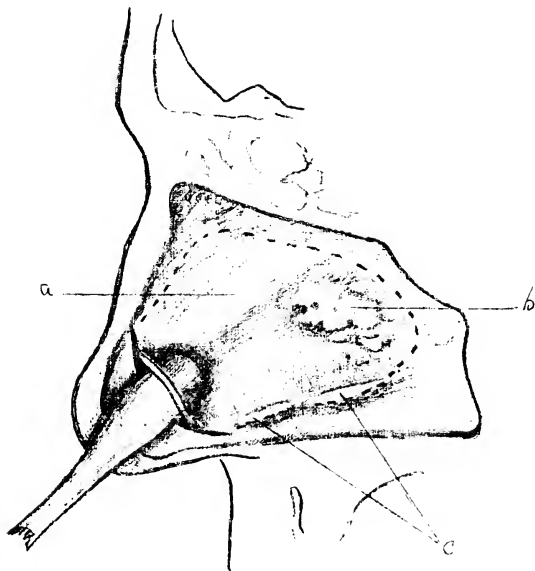


Fig. 7. a. High deviation of cartilage and perpendicular plate opposite the middle tubinated body. b. Irregular or gnarled deformity of the perpendicular plate. c. Ridge at junction of the vomer and perpendicular plate. The semi-sharp elevator is shown starting the elevation. The dull one should now be substituted for it.

duce the index or little finger of the left hand into the opposite nostril, so that he can be guided by the sense of touch in determining when the incision is through the entire thickness of the cartilage. When the point of the knife is through the cartilage it is appreciated at once by the finger in the opposite nostril. Under no circumstance should the mucous

membrane of the opposite side be incised as to do so will result in a permanent perforation of the septum, unless the incision upon one side is sutured before the dressings are introduced.

Having completed the cut through the cartilage the semi-sharp elevator should be introduced through the incision with its flat surface resting against the opposite side of the cartilage. It should now be gently pushed backward with an up and down motion to separate the anterior portion of the mucoperichondrium from the cartilage. When the elevator has separated the mucoperichondrium for about one-fourth of an inch, it should be abandoned and the ovoid elevator intro-

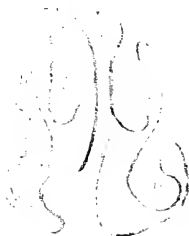


Fig. 8. Showing a double deformity of the septum. Above the septum bends to the left side of the nose, while below there is a large ridge. Both these obstructive lesions can be removed at one sitting by the submucous method of operating. Heretofore we have been obliged to remove a portion of the middle tubinated body on the left side and the ridge in two operations, each of which required from two to four weeks for healing.

duced in its stead. This should be pushed backward with an upward and backward motion until the entire area (Fig. 7) of the operative field upon that side is elevated.

Having thus roughly outlined the procedure, I will now call attention to a few of the limitations and difficulties sometimes encountered. The first of these is in starting the elevation. Simple as this procedure seems it is, nevertheless, to the beginner difficult as it may result in considerable laceration of the mucosa. The secret of success consists in completely incising the mucoperichondrium when making the incision. It should be remembered that there are two membranes to be incised, namely, the mucous membrane and the perichondrium. These are loosely attached to each other,

hence if the mucoperichondrium is not completely incised the elevator engages between the membranes. While they are rather loosely attached, they are, nevertheless, difficult to separate. If the elevator meets with considerable resistance, the procedure should be stopped at once, and the scalpel again used to complete the incision through the perichondrium. In order to be sure that the mucoperichondrium is completely cut through it is my custom to carry the incision a little way into the cartilage. When this is done it can be shown by turning the tip of the nose to the opposite side, thereby bringing the sharp-cut edges into view. Having done this, reinsert the semi-sharp elevator and begin at the edge of the incision and engage it beneath the mucoperichondrium. When this is done the perichondrium readily separates from the cartilage in nearly every instance. Having thus successfully started the elevation, it should be completed with the dull or ovoid elevator.

Another point of some practical importance is, that there is frequently an adhesion of the mucoperichondrium to the cartilage near the floor of the nose. When the sharp elevator cannot be made to separate the lower portion of the incision the bistoury should be used to sever the fibrous attachment at this point, after which the mucoperichondrium may be elevated with ease to the lower limit of the incision.

A third difficulty sometimes encountered is an extremely thin and atrophic mucous membrane, which readily tears with either the sharp or dull elevator. When such a membrane is present the elevation should be conducted with very great caution and slow speed.

A fourth difficulty encountered is in those septums which while not necessarily greatly deviated from the perpendicular plane, are, nevertheless, nodular and irregular in contour (Fig. 1b). In these cases I have found the perichondrium somewhat difficult to elevate, and if much force is used a perforation of the mucoperichondrium results. It is necessary, therefore, to proceed with caution, allowing the blunt elevator to go in the *direction of least resistance*, after which the adherent points may be elevated with comparative ease.

A fifth difficulty encountered in the elevation of the mucoperichondrium is in those cases in which there is an extreme deviation of the septum to one side. This is especially true when the deviation takes the form of a ridge or crest. It is

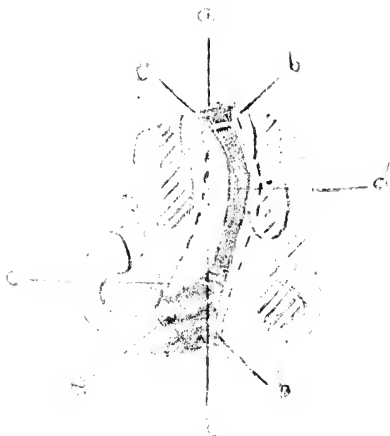


Fig. 9. a.a. Median line. b.b. Dotted line shows the extent of elevation on the side opposite the ridge. c.c. Shows the extent of elevation on the side of the ridge. d. Bend in the septum opposite the middle turbinate body. This should be removed to restore drainage and aeration to the superior meatus. e. Section through the ridge. This is best removed with the special gouge.



Fig. 10. S.S. Septum. a.a. Lower portion of cartilaginous septum to be removed separately with the swivel knife. b.b. Upper portion of the cartilaginous septum to be removed separately with the swivel knife. The enormous angular bend of the septum at a.b. may make it impossible to pass the prongs of the swivel knife over it so as to remove the cartilage in one piece. On the convex side at a.b. the operator should not attempt to elevate the mucoperichondrium lest he tear it.

possible in nearly all such cases to elevate the mucoperichondrium above the ridge (Fig. 9 c c) whereas, it is usually difficult or even impossible to do so below it. Indeed, I have found it unnecessary in the majority of my cases to attempt to elevate below the crest. I content myself, therefore, to limiting the elevation on the side of the ridge to the area above it. As a rule the larger portion of the crest or ridge is composed of bony tissue and should be removed submucously with the V-shaped gouge as will be hereinafter described.

A sixth difficulty encountered in the elevation of the mucoperichondrium is in those cases in which the cartilage presents a sharp angular deflection in a horizontal direction (Fig. 10). In these cases the angular deflection is situated higher than it is where there is a bony ridge or crest. It may be possible, therefore, to elevate the mucosa both below and above the angle of the deviation. In such cases the operator should not attempt to pass the elevator over the angle of the deviation on the convex side, as to do so might result in a laceration of the mucoperichondrium. In elevating the membrane on the concave side of the septum it is usually quite easily accomplished with the blunt elevator, even in the trough of the cartilaginous deviation, as the membrane separates in advance of the blade (Fig. 6).

The Swivel Knife in the Removal of the Cartilaginous Septum. Having elevated the mucoperichondrium upon the two sides of the septum the swivel knife (Fig. 1) should be introduced into the lower part of the incision, care being exercised to have the prong-tips within the cavity of the mucoperichondria, while the blade, resting between the tips, engages the cartilage. This is not difficult to do provided the adhesion to the septum in the lower portion of the incision has been previously cut with the bistoury. When this is not done there is sometimes considerable difficulty in getting the mucous membrane on the side of the incision to "balloon" enough to admit the prongs. To facilitate the insertion of the prong-tips I sometimes use the Killian speculum rhinoscopia media to separate the mucoperichondria until the prong-tips are inserted and the blade is pushed backward through the cartilage one-fourth of an inch or more. In many cases I instruct the patient to inhale forcibly, which

often results in a "ballooning" of the mucoperichondria, thus obviating the necessity for using the speculum. It is then easy to insert the swivel knife.

Having successfully placed the prong-tips astride the incised cartilage and between the mucoperichondria, the knife should be pushed backward along the floor of the nose, hugging the superior border of the vomer until it reaches the most posterior portion of the cartilage, namely, at the junction of the vomer and perpendicular plate of the ethmoid (Fig. 3). The prong-tips should then be directed upward and forward, hugging the antero-inferior border of the perpendicular plate of the ethmoid, until it reaches the region of the nasal bones. It should then be pulled downward parallel with the ridge of the nose until it emerges through the superior portion of the incision. By this procedure almost the entire quadrangular cartilage may be excised with the swivel knife. The anterior tip of the excised cartilage should be seized with a pair of dressing forceps and removed through the incision (Fig 3 kk) in the mucoperichondrium.

Some of the difficulties to be encountered in this procedure are the following:

1. The swivel knife sometimes becomes engaged against the little irregular spicules of bone projecting from the upper margin of the vomer (Fig. 3 a a) and the antero-inferior margin of the perpendicular plate of the ethmoid. When this occurs the prong-tips should be moved with a slight wriggling motion at right angles (Fig. 3 z) to the direction they have been traveling, and with a slight to and fro motion the blade is disengaged. The knife should be again directed as before, until the inferior and postero-superior portion of the cartilage has been encompassed.

It occasionally happens that the septum has been the seat of a perichondritis or septal abscess. In these cases it may be found that the frame work of the anterior portion of the septum is not true cartilage, but is composed of very dense fibrous or fibro-cartilaginous tissue. It may be difficult or even impossible to cut the tissue with the swivel knife unless it is very sharp. The latest model of the swivel knife has a U-shaped cutting edge which I hope will cut this tough fibrous tissue.

A third difficulty is calcified cartilage. It is not to be supposed that the swivel knife will cut through such tissue. It should be removed with a strong cutting forceps.

A fourth difficulty is found in cases with very angular deviations of the cartilage, as shown in Fig. 10. In such cases it may not always be possible for the deflected cartilage to pass between the prongs of the instrument. I have a special wide pronged swivel knife for this purpose, and have so far, found it capable of embracing the widest angular deviations. If the operator does not happen to have a wide model he should remove the cartilage in two pieces. That is, he should push the swivel knife along the floor of the nose then upward as far as possible and then cut forward along the angle of the deviation (Fig. 10 a b) to the mucoperichondrial incision. This piece of the cartilage should then be removed and the knife reinserted between the mucoperichondria to the posterior limit of the cartilage, when it should be made to engage the upper part of the cartilage and thus complete its removal.

In nearly all cases I have found it possible with my swivel knife to remove the cartilage in a few seconds. It is in this



Fig. 11. Gouge for the submucous removal of septal ridges. The gouge is an arc of a circle and the cutting edge is v-shaped, thus enabling it to engage readily in the septal ridge.

part of the operation that a great saving of time occurs. In addition to this the specimen is preserved in its entirety for study and inspection.

The Removal of the Bony Crest or Ridge. This is done submucously with the special gouge. (Fig. 11), mallet and forceps. The gouge should be inserted through the incision between the mucoperichondria and engaged in the anterior portion of the bony tissue. A few blows with the mallet splinters the bone backward, when with gentle prying

motion the splintering process may be made to extend still further backward. The gouge should then be disengaged and Grunwald's straight biting forceps (Fig. 12) inserted. The forceps should seize the splintered portion of the bony tissue and lift it from its attachment. This process should be continued until all of the obstructing bony tissue in this region is removed. It is not necessary to attempt to elevate the mucoperichondrium from the under surface of the bony ridge as the chiseling and splintering process separate it without endangering its integrity.

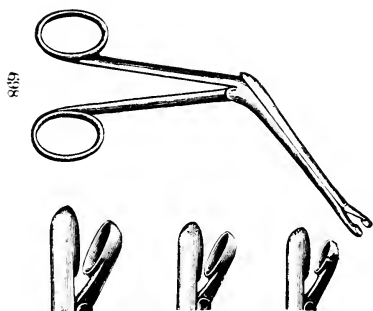


Fig. 12. Grunwald's forceps. They may be used to remove ridges after being splintered with the septum gouge, and to bite off small spicules of bone and cartilage.

The Removal of the Deflected Portion of the Perpendicular Plate. When the perpendicular plate of the ethmoid bone is deflected so as to obstruct the respiratory and olfactory region of the nose (Fig. 1), it should be removed submucously by means of bone cutting forceps, such as are described by Freer in his paper read before the American Laryngol., Rhinol., and Otol. Society at Boston, June, 1905, or by means of submucous saws as devised by me after Kyle's models (Fig. 13). With the straight saw the perpendicular plate is cut as shown in Fig. 14 aa and bb, while the connecting cut is made with the right angle saw as shown in (Fig. 14 c. d.) The quadrilateral plate of bone thus outlined is seized with a pair of strong dressing forceps and removed. This procedure requires but little time and seems superior to the use of bone-cutting forceps on account of the lessened traumatism and the preservation of the specimen for study and inspection.

Post-Operative Inspection. Having removed the cartilaginous portion of the septum, the bony ridge and the deflected portion of the perpendicular plate of the ethmoid, the mucoperichondria should be brought to the median line with a blunt pointed applicator, or a spatula. The nasal chambers should then be inspected by anterior rhinoscopy to determine whether or not there still remain obstructive malformations of the framework of the septum. If found they should be removed submucously by the means already described.

The Primary Dressing. Having satisfied himself that the entire obstructive portion of the septum has been removed the operator should lightly, but firmly, tampon both nasal chambers with sterile gauze, so as to bring the two mucoperichondria into apposition in the median plane of the nose.

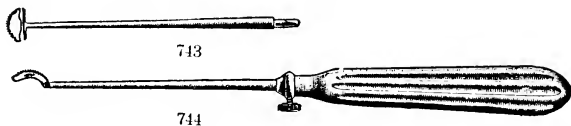


Fig. 13. Kyles septum saws. The author has modified them so as to adapt them to the submucous resection of the perpendicular plate of the ethmoid.

The dressings thus applied aid in preventing hemorrhage and hematoma between the membranes. Should a hematoma form it separates the membranes, the clot becomes organized, and a permanent obstructive thickening remains. After twenty-four to forty-eight hours the dressing should be removed, and, if the mucoperichondria are not unduly lacerated, healing by first intention will have taken place. If, on the contrary, there was extensive tearing of the membranes during the course of the operation, or if infection of the wound has taken place, it may require several days for complete union and healing. I have rarely found it necessary to introduce a second dressing.

The After Treatment. The after treatment consists, chiefly, in preventing the formation of crusts at the point of incision. In two of my cases the crust were of horn-like consistency and adhered closely to the mucous membrane. I removed the crusts by tamponing the nasal chambers with gauze moistened with a 10% solution of ichthyol, leaving them in place for twenty minutes, after which the crusts were readily removed without

injuring the epithelial covering of the mucous membrane. I instructed the patients to use sterilized vaseline in the anterior portion of the nares twice a day. After two or three weeks the horn-like crusts disappeared. In the majority of cases the crusts in this region are composed of dried secretions and are easily removed by sprays or irrigations. The

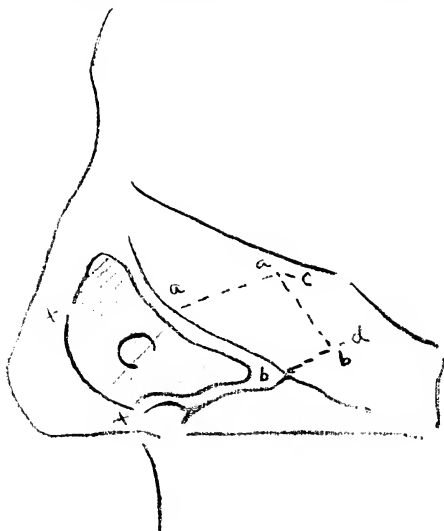


Fig. 14. c. Cartilage removed with the author's swivel knife. x.x. Killian's incision. a.a. and b.b. Submucous cuts made with author's modification of Kyle's septum saws. c.d. Perpendicular cut made with author's modification of Kyle's right angle septum saw. The area enclosed within these lines is removed en masse with a dressing forceps.

spraying or lavage of the nasal mucous membrane should be continued for a few weeks, or until such time as the crusts cease to form.

The Advantages of this Method of Operation. 1. It promises to be the most speedy method yet devised for the submucous resection of the septum. The lessened time required for the operation is chiefly accounted for by the use of the swivel knife for the removal of the cartilaginous portion of

the septum, and by the use of the submucous saws for the removal of the perpendicular plate of the ethmoid.

2. The use of the swivel knife in the removal of the cartilaginous portion of the septum reduces the shock and traumatism to the minimum.

3. The use of the submucous saws for the removal of the perpendicular plate of the ethmoid also reduces the shock and traumatism.

4. The deviated cartilaginous portion of the septum and the perpendicular plate of the ethmoid are removed in their entirety and are thus preserved for inspection and study.

5. Because of the lessened shock and traumatism, and the shortened time of anesthesia and operation, infection is less apt to occur, and healing usually takes place by first intention.

6. Fewer post-operative dressings are required.

7. The after treatment is shortened.

NOTE.—The instruments used by the writer for the submucous resection of the cartilaginous portion of the septum are manufactured by the surgical department of F. A. Hardy & Co., of Chicago, under the personal direction of Mr. L. R. Kratzmueller. It is essential that the blade of the swivel knife be very sharp, and that it be made of the very best steel. It should also swing freely between the prongs and be riveted to them. Mr. Kratzmueller exercises great care and interest in their construction, hence I confidently refer the reader to him for the instruments mentioned in this paper.

The writer has devised several types of swivel or universal cutting knives, including a single-pronged knife, the trowel-shaped handle, the angular handle, etc. He has also devised a knife using a strand of steel wire between the prongs' tips instead of the swivel blade. Another model utilizes a cautery wire between the prong-tips. After some experience in their use he recommends the straight instrument illustrated in this article. While the steel wire cuts cartilage it does so with considerable resistance. The cautery is complex, causes reaction and retards healing. The single-pronged swivel knife works well, and in extreme deviations of the cartilaginous septum has special advantages over the two-pronged swivel knife. The angular and trowel-shaped handles keep the operator's hand out of the line of vision, but they allow the instrument to turn while in use. I, therefore, recommend the

straight-handled, double-pronged swivel knife shown in Fig 1 as the best, all-round instrument. Hajek's elevators seem to be ideal. Their thickness is their chief merit. The thickness lifts the membrane ahead of the tip of the instrument, thereby lessening the liability to perforation.

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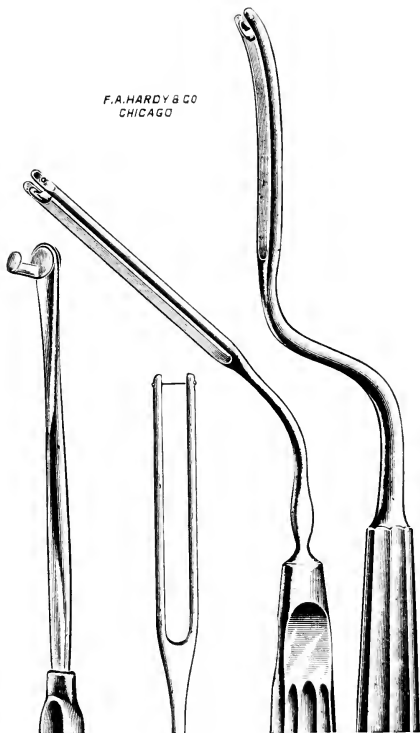


Fig. 15.

Fig. 16.

Fig. 17. Fig. 18.

Figs. 15, 17 and 18 show other models of the author's swivel knife. They are not recommended, however, as the one in Fig. 1 has proven most satisfactory. Fig. 16 shows a universal cutting knife, a steel wire stretched between the prongs forming the blade. It cuts with considerable resistance and is not recommended.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Contribution to the Study of Unusual Forms of Bezold's Mastoiditis with a Report of a Fatal Case Following Ligation of the Jugular Vein.

LUC (*Revue Hebdomadaire*, April 15, 1905.) The patient was a man of fifty with an acute suppuration of the left ear of five weeks' duration, following the injection of water into the nose.

When seen by Luc there was a small perforation in the posterior superior quadrant. There was difficulty in moving the head and pain on pressure over the mastoid and upper portions of the upper sterno-cleoid: an enlargement of the opening in the drum was made at that time. Four days later—improvement not taking place—the mastoid was opened. No infiltration below the tip was discovered.

Four days later, with elevation of temperature, torticoles occurred with swelling over the muscle. An incision into the muscle was made without finding pus. A week later the temperature became high. Upon examination, pus was found upon the lower wall of the antrum. Pressure over the neck also forced up pus. A second operation was accordingly performed, and an enormous amount of pus was discovered beneath the deep tissues of the neck.

Two days later erysipelas developed, which persisted for ten days. Suddenly there was the development of great increase of fever without involvement of any of the thoracic organs.

At the time of the first operation, the lateral sinus had been exposed and so had been bathed in pus which had flowed up from the neck. A phlebitis of this vein was suspected although the temperature was not of a pyemic character.

On the following day the vein was excised and the sinus opened and found filled with a clot which was thoroughly removed together with the wall. This operation lasted an hour and not more than twenty-five drachms of chloroform were used.

The patient never recovered from the anesthetic.

The case is critically considered by the author who regards it as a mistake that the presence of pus in the neck was not earlier recognized, and dwells at considerable length on the cause of death which he cannot ascribe to chloroform shock or to a septic condition, but rather believes it due to a lesion of the central nervous system, which might have been avoided if the jugular had been tied above the junction of the thyro-linguo-facial branches instead of below them.

Harris.

Concerning Regional Anesthesia of the External Auditory Canal.
(Zur regionären Anästhesie des äusseren Gehörganges.)....

LAVAL, P., (*Archiv. für Ohrenheilkunde*, Vol. 64, Nos. 2 and 3, 1905.) v. Eicken has recently published his results in regard to anesthetizing the external canal, and has also given the results of his investigations in local anesthesia of the middle ear in performing ossiculectomies.

The author's observations made independently of v. Eicken, in Schwartz's Clinic, are given in this paper. Laval produces local anesthesia of the nerves supplying the auditory canal. The operative field is supplied by three branches, with sensory fibres, whose anatomical relations the author determined with accuracy on cadavers.

Anteriorly the n. meatus acustici externi, a branch of the auriculo-temporalis, extends through the canal close to the lateral border of the bony canal, and distributes two or three fibres along the anterior wall. A branch of the auricularis n. vagi, also supplies the anterior part of the canal, dividing into two branches. It supplies the posterior wall of the canal, and the larger portion of the tympanic membrane. The third nerve is a branch of the n. auricularis magnus. It supplies a portion of the concha and the lobulus with sensory fibres. In the majority of the operative procedures, in the region of the auditory canal, the first two mentioned nerves are of importance, although cases occur in which anesthesia of the third nerve suffices to allow painless operations. After disinfecting and anesthetizing the external skin with a spray of ethyl chlorid, the needle of the Pravaz syringe is entered about $\frac{1}{2}$ cm. in front of the tragus and carried up in the direction of the floor of the canal to a depth of $1\frac{1}{2}$ cm. About $\frac{1}{2}$ ccm. is injected here. While this is being done

the mouth of the patient should be kept wide open. In the same way, the vagus branch can be reached, if the needle, while gentle traction is made on the concha, is carried out close behind the fold of the ear, between the cartilage and bone of the mastoid process, and about 1 cm. directly down.

The author uses for his injections a solution of Braun's cocain-suprarenin tablets, one in 1 ccm. distilled water.

One tablet contains 0.01 of cocain, 0.00013 of suprarenin, and 0.009 natr. chlor. One ccm. of physiological salt solution is also added, so that the solution contains $\frac{1}{2}$ per cent cocain in normal salt solution. For men he uses a 1 per cent solution, and for women and young people a $\frac{1}{2}$ per cent solution.

Anesthesia is obtained in about five minutes, and usually lasts fifteen or twenty minutes. Injections as well as operations were always painless. Symptoms of intoxication were never observed.

During the summer of 1904, the author operated upon 11 cases, and during the past winter upon 4. The majority of the operations were for furunculosis of the canal, although the author has also used this method for ossiculotomies, and for performing paracenteses.

In conclusion, the writer states that regional anesthesia will certainly be distinctly useful in operations upon the external canal. The operation for furunculosis can be much more thoroughly performed by this method than was formerly the case, and can be rendered absolutely painless. *Theisen.*

A Case of Secondary Purulent Otitis Media, Complicating an Empyema of the Maxillary Antrum. (Ein Fall von sekundaerer Otitis media purulenta, im Anschluss an Empyem der Highmorshoehle.)

KONIETZKO and ISEMER (*Archiv. für Ohrenheilkunde*, April 27, 1905.) At the post-mortem examination of a woman who had died of general sepsis, an involvement of the middle ear was suspected because when the brain was removed, a discoloration of the dura in the region of the temporal bone was noticed. The authors were enabled to determine the existence of an empyema of the left maxillary antrum with a complicating purulent otitis media.

The atopsy findings were as follows: The dura was smooth, barely transparent, vessels partly filled. The inner surface also smooth and covered with partly yellow, and partly light-

red fine, non-adherent membranes; at the base, a greenish-yellow discoloration in the region of the tip of the left temporal bone. Meninges soft and transparent, with the exception of a slight cloudiness of the posterior parts of the left parietal and occipital lobes.

On section of the dura at the base of the skull, at the above mentioned discolored region, a purulent coating was found between this and the pars basilaris of the occipital bone. The left half of the body of the sphenoid, and a portion of the pars basilaris of the occipital were chiselled out, and the left pterygo-palatine fossa and pharynx uncovered.

The tissue under the bone was found to be grayish-black in color and necrotic. The posterior superior wall of the left superior maxillary bone was carious toward the pterygo-palatine fossa and broken through, the opening being as large as a cent. After enlarging this opening, the antrum of Highmore was found to be filled with putrid pus.

The sphenoidal sinuses were opened and found normal, as well as the left ethmoid labyrinth, whose most posterior cell dipped deeply into the body of the sphenoid.

After removing the left temporal, the venous plexus surrounding the internal carotid, particularly in the course of the bony carotid canal, was found partly thrombosed and partly suppurating, and the perivascular tissue discolored and necrotic. After removal of the bony wall, the tympanic membrane was found to be intact and transparent, but pus could be seen shining through it. The tympanum was opened by removing the tegmen tympani, and was found filled with yellow pus, as was the tube, the mucous membrane of both being somewhat thickened. Aditus, antrum, labyrinth and bony walls of the middle ear were found to be normal. No thrombus was found in either the jugular vein, the bulb, or sigmoid sinus.

The authors believe that the primary disease was in the antrum of Highmore.

As before mentioned, the posterior superior wall was carious and perforated and from there the inflammatory process extended by way of the cellular tissue of the pterygo-palatine fossa through the Vidian canal, and caused a thrombosis of the venous plexus about the internal carotid. From there the infection could easily extend toward the pars basilaris of the occipital bone and also to the lymphoid tissue sur-

rounding the tube, and cause the tensor tympani muscle to become diseased. By way of this muscle, the inflammatory process extended to the tympanic cavity.

The patient died of general sepsis before aditus, antrum, etc., became involved. The fact that the tympanic membrane, aditus, antrum, and labyrinth were found normal, proves that the infection did not start in the middle ear. There are only five cases in the literature of empyema of the maxillary antrum with fatal complications.

The author's case is probably the only one complicated by secondary purulent otitis media. *Theisen.*

The Distribution of the Blood-Vessels in the Labyrinth of the Ear of the Sheep and of the Calf.

SHAMBAUGH, Chicago, (*Archives of Otolaryngology*, Vol. xxxiv, No. 2.) In working out the circulation in the labyrinth of the ear of the domestic pig, the author noted striking variations in the course of the blood vessels from that described for the human ear. In making preparations of the blood-vessels in the labyrinth of the sheep and of the calf, the variations found between these and the pig were as striking as those found between the pig and the description in literature of the vessels in the human ear. A comparative study leads to the following conclusions:

1. The scheme for the arterial supply to the vestibule and semicircular canals is a constant one, and consists, first of a separate branch of the labyrinthine artery, the anterior vestibular artery, which supplies the macula acustica utriculi and the anterior crura of the superior and lateral semicircular canals; second of a single trunk, the posterior vestibular artery, or of two trunks, which come from the labyrinthine artery at the base of the cochlea and supply the posterior crura of the posterior and lateral semicircular canals and the crus commune. A small artery, a branch of the posterior vestibular artery, leaves the vestibule along the aquaeductus vestibuli.

2. Anastomotic loops between the several branches of the labyrinthine artery in the bottom of the meatus acusticus internus and at the base of the cochlea were most pronounced in the labyrinth of the calf and least in that of the sheep.

3. The scheme for the arterial supply to the cochlea varies widely in its details for the three species. In the sheep and the calf, branches from the labyrinthine artery radiated over the

under surface of the basal coil and one of these small arteries left the labyrinth along the canaliculus cochleæ. In the labyrinth of the pig, the arteries under the basal coil were not found, and the vessels about the canaliculus cochleæ were embedded in the capsule and were consequently destroyed by the corrosion, except in young embryos where the capsule was still cartilaginous and did not require removal in making the celloidin casts. Yet in the latter preparations I was enabled to find an artery leaving along the canaliculus cochleæ.

4. Between the spiral vessels lying under the funnel of Corti and the vessels in the ligamentum spirale, communications were found in all three species. These consist of small, straight veins, which appear at irregular intervals.

5. The venous blood from the cochleæ in all three species empties into the vena canaliculi cochleæ. In none were any veins found in the meatus acusticus internus which received tributaries from the cochleæ.

6. In all three species, the venous blood from the vestibule and the semicircular canals drains into the vena canaliculi cochleæ, with the exception that in the calf the vein from the crus commune often leaves the labyrinth along with the aquaeductus vestibuli.

7. The membrana vestibularis is supplied with a network of vessels in the sheep and the calf, but in the pig no vessels were found in this structure.

8. Two large veins, the anterior and the posterior vestibular veins, collect the blood from the vestibule and the semicircular canals in the pig and the calf, their distribution being the same as for the anterior and posterior vestibular arteries respectively. In the sheep the anterior vestibular vein is wanting, its place being taken by the posterior vestibular vein, which collects the blood from the whole of the vestibule and the semicircular canals.

9. The location of the vessels in the semicircular canals in all three species is the same. The arteries for the most part cling to the endosteum, lying along the concave side of the osseous canal; the veins and the capillaries are confined to the membranous canals.

Campbell.

The Pathology of the Infant's Ear Underlying Aural and General Disease.

KENEFICK, New York, (*Archives of Otology*, Vol. xxxiv,

No. 2.) Under ordinary conditions pyogenic microorganisms from food and inspired air may invade the cavities of the temporal bone without special disturbance, but in the presence of lowered vitality from disease, conditions favorable to the development of these pyogenic organisms and the elaboration of their toxins are brought about.

Politzer states that middle ear inflammatory exudations are found in broncho-pneumonia, bronchitis, intestinal catarrhs and the acute and chronic infectious diseases. Inflammation of the faucial and pharyngeal tonsils is a common cause of extension by way of the Eustachian tube to the tympanum.

In middle ear inflammation the tension may be so great as to cause convulsions, or where there is incomplete osseous protection, paralysis of the facial nerve. Where no sufficient outlet has been provided by spontaneous puncture or paracentesis, pus may escape upward and outward through the Rivinian fissure in the antral roof and backward between bone and periosteum to form an abscess immediately behind and above the ear.

Again, pus may escape through the imperfectly closed roofs of the antrum and tympanum to the middle cranial fossa causing an epidural or cerebral abscess. Infection may extend through the imperfect floor of the tympanum, setting up thrombosis in the jugular sinus and bulb.

So subtle is the method of extension of infective microorganisms, especially along the sheaths of nerves and the walls of lymph and blood-vessels, that there is scarcely a single intracranial infection of otitic origin which may not occur without rupture of the mt. and without apparent lesion of the internal protecting structures of the skull.

As to general disease with which severe ear disease is frequently associated, scarlet fever easily leads. The progress of the otitis may be characterized by the most severe and rapid inflammatory process, ending not only in destruction of the contents of the tympanum, but involving the internal ear and cerebral structures directly through the labyrinthine wall. Scarlet fever destroys the internal ear from without, cerebro-spinal meningitis on the contrary invades from within the brain, passing from the neighboring meninges to the aqueduct of the cochlea and vestibule affecting both the hearing and the equilibrial branches of the auditory nerve as well as its trunk and nuclei. Hence the staggering gait and hopeless deafness of those who recover.

..Campbell.

The Anatomy of the Child's Ear, Emphasizing Points of Practical Importance.

BRYANT, New York, (*Archives of Otology*, Vol. xxxiv, No. 2.) At birth the temporal bone is soft and spongy, mostly diploic, except the capsule of the labyrinth, which is dense bone. At the close of the first year it is quite solid, yet thin.

The temporal bone, at first, is very vascular, traversed by many foramina containing vessels which allow free circulation of the blood between all the surfaces of the bone.

The annulus tympanicus is firmly attached by its apices to the outer plates of the squamous bone. The petro-mastoid portion is separated from the squamous by a cartilaginous plate and the petro-tympanic suture is wide open, but before the end of the first year all the parts are united.

The walls of the mastoid antrum are of spongy bone. The outer one made by the posterior process of the outer plate of the squama is softer and thinner than the tegmen which explains the readiness with which post-aural abscesses occur in infancy.

The development of the mastoid begins about the second year and is completely developed shortly after puberty, at which time the groove of the sigmoid sinus is fully formed.

The tympanic cavity of the infant is about as extensive as in the adult. Sieve-like bone separates the floor of the tympanum from the carotid canal and from the jugular fossa. The oblique position of the meatus and this thin plate of bone would permit a puncture of the jugular bulb during paracentesis. At birth there is coaptation of the superior and inferior walls of the external auditory canal and of the mt. with the inferior wall. The irregularities are filled with desquamated epithelium. A few days after birth the meatus slowly opens forming an hour-glass shaped canal with the construction corresponding to the isthmus in the adult. At birth half of the meatus is membranous and the other half cartilaginous.

The tympanic air cavity does not exist at birth, the osseous cavity being filled with myxomatous tissue and cellular detritus. The mt. is the same size as in the adult. The contents of the tympanum proper are fully developed at birth.

Campbell.

Otitis Media in Children.

JACOBI, New York, (*Archives of Otology*, Vol. xxxiv, No.

2). Otitis may be either a mere surface inflammation or one complicated with thrombosis or suppuration, or caries, or facial paralysis or meningeal complications. It may be primary or secondary to a naso-pharyngeal disease, be caused by or appear contemporaneously with pneumonia, cerebro-spinal meningitis or enteritis.

Preysing found in the autopsies of 100 infants dead of a variety of diseases, 154 diseased ears and of these in only 9, was there a perforation of the mt. This infrequency of perforation is believed to be due to several reasons:

1. The greater resistance of the mt. in the young, the external cutis layer being often thicker than in the adult and the median connective membrane very solid.

2. In the young the Eustachian tube is short but wider and the direction of the canal almost horizontal.

Campbell.

The Operative Treatment of Diseases of the Ear in Childhood.

DENCH, New York, (*Archives of Otolaryngology*, Vol. xxxiv, No. 2.) Whenever a child is found suffering from an acute inflammation of the middle ear giving rise to a persistent increase in temperature, operative treatment is imperatively demanded.

Early and free myringotomy in all cases of acute otitis in childhood is urgently called for. The younger the patient, the earlier should this simple operation be performed. Where there is any sinking of the upper and posterior canal wall, the incision should be carried well outward on to the superior wall of the bony meatus.

Of the various complications in acute middle-ear inflammation one deals with them as in the case of adults. In mastoiditis operate earlier as inflammation is more prone to spread, particularly to the meninges. Pus often escapes through the Rivinian segment, forming a post-aural abscess without any rupture of mt.

In all cases of middle-ear inflammation in childhood, where free myringotomy does not relieve pain and temperature at the end of a few days, the mastoid should be opened.

Infection may extend to the bulb either with or without mastoid involvement. Where there are marked intermissions in the temperature, one should suspect sinus involvement. If both ears are involved both sinuses should be in-

cised and explored after doing the complete mastoid operation.

An epidural abscess is seldom diagnosed before operation is made upon the mastoid and with a large operative field, removal of all diseased bone will lead the surgeon to the discovery of any collection of pus between the dura and the skull. In draining this never break down the adhesions limiting the abscess.

General or diffuse meningitis is very fatal. Infection usually takes place through the antral or tympanic roof. If the diagnosis is made extremely early and the site of infection packed off from the general cranial cavity by means of iodoform gauze, occasionally the patient may recover.

A number of cases of serous meningitis have been relieved by successive lumbar punctures. When these cases occur in conjunction with an otitis, thorough operation also must be undertaken on the mastoid and middle-ear.

The localization of brain abscess is more difficult than in the adult. The most frequent site is in the middle cranial fossa, the temporo-sphenoidal lobe. Free exploratory incision is the only feasible method of discovering these abscesses.

The chronic middle-ear inflammations of childhood rarely require operative measures. The upper air passages should be put in a thoroughly healthy condition. Enlarged tonsils and adenoid should be removed. General hygiene should be looked to, and frequent colds should be guarded against by the daily use of a cold sponge bath and suitable underwear.

In suppurative cases, systematic cleansing of the ears by use of antiseptic solutions. General measures failing, the radical mastoid operation must be undertaken, and an important point is to secure an exceedingly large and potent external auditory meatus.

Campbell.

II.—NOSE AND ACCESSORY CAVITIES.

An Earnest Plea to Classify Lupus of the Nose as a Form of True Tuberculosis.

MASSEI (*Revue Hebdomadaire*, March 11, 1905.) The author shows conclusively that both histologically and clinically lupus is not to be distinguished from tuberculosis. He recognizes in lupus of the nasal mucosa two forms, *ulcerative* and *vegetative*. The ulcerative form is the rarer of the two,

insidious in its beginning. It begins in the anterior part of the cartilaginous septum, but soon invades the entire floor, outward and to the side. In the majority of the cases the ulcer is single or of small dimensions, the size of a pea or a little larger and round in form; but multiple ulcers have been observed.

The *vegetative* form has a predilection for the same locality. It is usually solitary, sometimes multiple, suggesting granulations varying from the size of a pea to a nut. It is of a grayish color and may suggest a "papilloma." The consistence is soft and friable and it bleeds easily. It is sessile or pedunculated.

Lupus may be confused with syphilis, polyps and rhinoscleroma. Thorough removal of all disease by means of the curette is recommended as early as possible.

Electrolysis is not favored.

Harris.

Odors and Cardiac Troubles.

JOAL (*Revue Hebdomadaire*, April 29, 1905.)

An interesting paper in which the author sets forth claims based on his own observations and those of others for a relationship between certain functional forms of heart disease (syncope, palpitation, precordial pains and false anginas) and an abnormal condition of the olfactory nerve.

A similar relation between this nerve and certain symptoms referable to the stomach and chest has already been pointed out.

In addition to numerous quotations from the literature, the author gives the history of fourteen cases occurring in his own practice where treatment of the nasal condition relieved more or less fully the symptoms complained of. In his opinion such symptoms are dependent upon an exaggerated susceptibility of the nerve centres situated in the bulb and a peculiar hyper-excitability of the filaments of the olfactory nerve. Added to this there exists a high degree of sensibility of the nasal branches of the trigeminal.

Harris.

The Real Value of Aero-thermotherapy in the Therapeutics of Oto-Rhinology.

LERMOYEZ and MAHN (*Revue Hebdomadaire*, March 4, 1905.) A conservative up-to-date presentation of the subject by its originators as far as rhinology is concerned; the

principles under which it is used are succinctly stated and the apparatus employed by them given in detail.

The hot air is to be applied directly to the point which it is desired to affect and is brought as near as possible to the surface. Duration is but a minute or two, and all due precaution is taken to protect patient from cold. He (patient) should remain in the apartment one-half hour after treatment to avoid too sudden a change of temperature. The authors summarize the results of their treatment as follows:

Excellent in spasmodic rhinitis even to being a specific in hydrorrhea nasalis.

Second, good in congestive rhinitis.

Third, fair in chronic coryza.

Fourth, useless in ozena and in all cases when suppuration from the sinuses exists.

All obstructions in the nose are first to be removed.

In the ear, heated air has a sedative effect. In otalgias of tubal or naso-pharyngeal origin it gives excellent results. In the same way, in tubal obstruction with deafness and tinnitus occurring in the course of tubal or tubo-tympanic catarrh, benefit is observed.

Harris.

III.— MISCELLANEOUS.

A Peculiar Form of Hyperplasia of the Mucosa.

SEMON, SIR FELIX (*Revue Hebdomadaire*, February 25, 1905.) Semon reports a case of a woman of thirty in good health who showed a general thickening of the palate including the pillars of the uvula, epiglottis, the arytenoid cartilages, etc. It had a yellowish shining appearance which one would describe as lardaceous.

Tuberculosis was considered, but excluded because all other symptoms were lacking. There was a tendency to ulceration. The case was under observation for two years. All treatment was futile. Suddenly the condition entirely disappeared. The author has observed two other cases with the same local appearance. In the third case an histologic examination was made and showed a picture similar to the second stage of hypertrophic rhinitis. Semon has found a case exactly similar to these reported by Kelley and several others that simulate it.

Harris.

Treatment of Syphilis.

CAPART (*Revue Hebdomadaire*, March 18, 1905.) The writer, speaking from a large experience, discountenances the classical divisions of the disease. Liability to mistake it or overlook it is constantly to be borne in mind.

The forms recognized are the *benign* syphilis, *grave* syphilis and *galloping* syphilis.

The first type is capable of being healed by hygienic treatment alone. The second type may even result in death. It is also marked by frequent recurrence. The third form is indicated by its name.

In the treatment the greatest importance is attached to mercury. Preference is given to hyperdermic injection of soluble or insoluble salts. The sublimate is used when speedy result is desired. The formula used and its method of use is given in full. When possible, however, the salicylate or calomel are used. They are to be employed every eight days when the dose is ten centigrammes, every five days when the dose is five centigrammes. Great attention must be paid to the thorough cleansing of the syringe and needles (which are of platinum, and five to six centimeters in length), by means of heat and ether.

The pain is variable. An abscess has never been observed.

The injection should be continued for a long time (two or three years), at longer or shorter intervals. Potash in large doses is advised for all forms of late syphilis.

Harris.

BOOK REVIEWS.

ALLING AND GRIFFIN'S DISEASES OF THE EYE AND EAR. A Manual for Students and Physicians. By ARTHUR N. ALLING, M. D., Clinical Professor of Ophthalmology in Yale University, Department of Medicine, New Haven, Connecticut, and OVIDUS ARTHUR GRIFFIN, B. S., M. D., Late Demonstrator of Ophthalmology and Otology, University of Michigan, and Oculist and Aurist, University Hospital, Ann Arbor, Michigan. In one 12mo volume of 263 pages, with 83 illustrations. Cloth, \$1.00, *net*. Lea Brothers & Co., Publishers, Philadelphia and New York, 1905.

The authors present the subjects of Ophthalmology and Otology in as clear, thorough and interesting a manner as the limited space permits.

While essentially a work for students, it will prove of great service to the busy practitioner, who wishes to keep abreast of the times and to quickly review these special subjects.

The illustrations are well chosen, numerous and effective.

James T. Campbell.

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XXV.

FRONTAL SINUSITIS—DIAGNOSIS, TREATMENT
AND RESULTS.*

By C. G. COAKLEY, M. D.

NEW YORK.

ACUTE FRONTAL SINUSITIS.

The basis of the following remarks is derived from a study of fifty-eight cases of acute frontal sinusitis, occurring in private practice between January 1, 1903 and January 1, 1905.

Diagnosis. The diagnosis of acute frontal sinusitis is made from a grouping of certain symptoms given by the patient, together with the observations of the physician as a result of his examination.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

As acute frontal sinusitis seldom occurs alone, but with simultaneous involvement of some of the other sinuses, patients give a composite set of symptoms varying with the sinuses affected and the relative severity of each.

SUBJECTIVE SYMPTOMS.

First. Pain or Neuralgia. The most important symptom from the standpoint of patients is the pain or neuralgia for which they seek relief. It is most intense in the supraorbital region of the forehead. It may, however, radiate thence to the temporal region, ear, back of the eye, vertex or occiput. The pain is not always constant, but usually worse in the morning for the first hour after awaking. During the day there are frequent painful periods, lasting from a few minutes to an hour, and then there may be considerable diminution before the next paroxysm appears. During the height of the paroxysm, in addition to the lancinating, shifting, neuralgic pain, there is frequently a marked pulsation or throbbing referred to the region of the frontal sinus. Blowing the nose is usually such a painful act, and so greatly intensifies the pain over the eye that most patients perform this act as infrequently as possible. Percussion on the forehead over the affected sinus is invariably painful and in marked contrast to the painless percussion over the corresponding area on the healthy side. Kuhnt, in his work, "Ueber die entzündlichen Erkrankungen der Stirnhöhlen und ihre Folgezustände," Wiesbaden, 1895, claims that the outlines of the diseased frontal sinus may be quite accurately determined by percussion over the forehead. We have not been able to verify this statement except in a general way. Unquestionably the larger the frontal sinus, the larger the area over which one elicits pain on percussion; more than this we cannot state. More typical, however, than the percussion over the frontal region is the pain produced by pressing upon the floor of the frontal sinus above the inner canthus of the eye. This pain is very marked and is quite analogous to the pain produced by pressure on the mastoid in acute mastoiditis. A less degree of pressure is necessary than in mastoiditis, as the floor of the frontal sinus is at this point thinner than the average cortex of the mastoid. In no single instance of acute frontal sinusitis has this sign been absent. In one case, cited below, there was present the intense neuralgic pain in the right supraorbital region, pain

on percussion over the frontal surface of the frontal bone, and intense pain on pressure over the orbital plate of the frontal, and yet on operation we found that the patient did not have any right frontal sinus.

Second. Discharge from the Anterior Nares or into the Naso-Pharynx. Every case of acute frontal sinusitis was accompanied by a discharge from the sinus into the nose. While it is possible to conceive of a total occlusion of the naso-frontal duct, we have not met with one. In the upright posture the discharge enters the middle meatus, whence it drops down to the floor and is blown from the anterior nares. During the time that the patient is in the recumbent posture, the direction of the flow is backwards along the upper surface of the inferior turbinate into the naso-pharynx. Occasionally when some obstruction exists anterior to the opening of the naso-frontal duct, the discharge is entirely directed posteriorly, even when the patient is in the upright position. In the earlier stages of the inflammation the secretion is thick, glairy, whitish, mucoid in character; at this time, when examined microscopically, it consists of mucus in which are imbedded a considerable number of well-preserved leucocytes. As the disease progresses the discharge becomes yellowish, still remaining tenacious, and the number of leucocytes greatly increases. With spontaneous or other cure, the discharge becomes less yellow, the number of leucocytes diminishes, and it takes on more of a serous character at its termination. As the disease passes from the acute to the chronic type, the discharge loses its mucoid character, becomes thinner, distinctly yellow, and the pus cells, many of which are disintegrated, predominate. The discharge from a frontal sinus cannot be distinguished from that which comes from an antrum or any of the other accessory sinuses in the nose. Discharge alone, therefore, from the nose or naso-pharynx is not sufficient evidence to warrant a diagnosis of frontal sinusitis.

Third. Nasal Obstruction. In a very large percentage of cases there is sufficient turgescence and swelling of the mucous membrane of the middle turbinate and the rest of the nasal mucosa, to prevent respiration through the affected side. This symptom is not peculiar to frontal sinusitis, but is a part of the history of acute rhinitis as well as that of acute infections of the other accessory cavities which are so often simultaneously involved.

Fourth. Anosmia. The loss of the sense of smell is directly due to the nasal obstruction above mentioned. While present in most cases of acute frontal sinusitis, it is by no means solely limited to affections of this sinus.

Fifth. Redness of the Alae Nasi, Eczema and Herpes Nasalis. The above-mentioned conditions are very common in acute suppurations of the frontal sinus, but like the two preceding may also exist independent of sinusitis. They are due to the frequent use of the handkerchief, to the softening and maceration of the skin and the infection of the same from the irritating discharge.

Sixth. Edema and Redness of the Upper Eyelid. In some of the more severe cases in which the outlet of the naso-frontal duct is greatly narrowed and the secretion within the sinus under considerable pressure, the interference with circulation in the bone and periosteum over the sinus manifests itself as an edema usually with some redness or ecchymosis of the upper eyelid and the skin over the forehead near the median half of the eyebrow. In our series of fifty-eight cases this symptom occurred eleven times.

Seventh. Bulging of the Walls of the Sinus. As a result of greater pressure of the contents within the sinus, the walls of the frontal sinus bulge at their weakest point. This is usually at the floor of the sinus just above and posterior to the inner canthus of the eye. Palpation in this region, exquisitely tender under these conditions, always shows a convexity of the floor instead of the concavity as ordinarily found. Five of our series presented marked bulging of this kind. The anterior wall is said to have been the seat of bulging, but we have never met with a case.

Eighth. Diplopia. When the prolapse of the floor of the sinus is considerable, the eyeball may be displaced downwards and outwards with a consequent diplopia. Two cases presented this symptom. The eyeball not infrequently has the appearance of being displaced downwards and outwards when there is edema of the upper eyelid: one must be careful, therefore, to distinguish between actual and apparent displacement of the eye. An associated ethmoiditis may cause displacement of the globe of the eye. The differential diagnosis may be difficult, but in either case immediate operative treatment is demanded to relieve the pressure.

Ninth. Fistula Formation. Unless the tension within the

frontal sinus is quickly relieved from the conditions mentioned under headings VII and VIII, the contents of the sinus break through the bony wall of the floor of the cavity, distend and necrose the skin of the upper eyelid, forming a fistula in this region. None of my acute cases developed a fistula. One of the series in the chronic cases had a fistula develop in the acute stage, a result of failure on the part of the attending physician to recognize the trouble.

Tenth. Instances are on record where the posterior wall of the frontal sinus has been absorbed from pressure and the contents evacuated into the cranial cavity with a resultant meningitis. It is possible that this happened in one of my cases (Case III), but as there was an associated ethmoiditis and sphenoiditis and no autopsy was allowed, the matter will always remain in doubt.

OBJECTIVE SYMPTOMS.

Examination. While some of these points have been given above, there remain the examination of the nose and nasopharynx. On inspecting the nasal cavity of the affected side the mucous membrane is usually found so red and swollen and the cavity so filled with tenacious muco-pus as to render any exact diagnosis impossible without first contracting the tissues with cocaine and adrenalin. When this has been accomplished muco-pus will usually be observed issuing from below the middle turbinate, or between it and the outer wall. Secretion in this region may have come either from the frontal sinus, ethmoidal cells or antrum. The antral source of secretion can usually be quickly eliminated by puncturing and washing out that cavity, thereby removing the secretion. If there is still secretion issuing from the middle meatus, the frontal sinus and ethmoidal cells remain to be considered. If pain on percussion and pressure over the frontal sinus has previously been obtained, and if in addition transillumination of the frontals shows considerable darkness on the affected side as compared with the healthy side, the presumption of frontal sinusitis is so great that one may regard it as practically certain. On account of the proximity of the middle turbinate to the outer wall of the nose, we have never been able to pass a probe or canula through the naso-frontal duct into the sinus in an acute case without having recourse to one of two measures:

First. The use of the medium sized Killian nasal speculum which is inserted, with the blades closed, between the middle turbinate and the outer wall and then the blades opened so as to spring the middle turbinate over towards the septum. While theoretically this may be done, in many cases it is practically impossible, in private patients, on account of the great pain produced even when the parts are thoroughly cocaineized. If the septum is deviated to the affected side it may leave insufficient space for the pushing over of the middle turbinate. We have employed this method in some of our clinic cases and thus assured ourselves of its availability.

Second. The anterior end of the middle turbinate may be removed with forceps and snare sufficiently far back to uncover the outlet of the naso-frontal duct. It may then be possible to probe or catheterize the diseased frontal sinus. We have seldom found the naso-frontal duct so patent in acute cases as it is in chronic suppuration of the frontal sinus. At best, probing and catheterizing in acute cases is a very painful procedure, and of doubtful utility. Examination of the posterior nares reveals nothing typical of frontal sinusitis. The posterior ends of the inferior and middle turbinates are swollen and hyperemic; above the inferior turbinate and stretching down to the upper surface of the velum there is often seen a thick, tenacious secretion. In the event of such obstruction in the anterior nares as to prevent the secretion passing forward below the inferior turbinate, the post-nasal secretion should excite one's suspicion of a sinusitis; such a secretion, however, may come from the antrum, ethmoidal cells, or frontal sinus or possibly the sphenoid.

Acute Frontal Sinusitis Combined With Acute Inflammation of the Other Sinuses. In some cases it is very difficult to determine the number of the other accessory sinuses involved at the first visit, owing to the intensely swollen condition of the nasal mucous membrane. Transillumination of the antra is a simple procedure, and shadows point to the probability of their being involved. Of the fifty-eight patients, seventeen had both of the frontal sinuses involved, while forty-one had only a single sinus, the right twenty-two times and the left nineteen times. Of the forty-one cases of unilateral frontal sinusitis the antrum showed clear on transillumination seven times and was not irrigated. In the thirty-four cases where there was a shadow on the face of the affected side, the antrum

was irrigated and pus washed out in each case. Of the seventeen cases of bilateral frontal sinusitis, both antra were irrigated, owing to imperfect transillumination, and pus found in every case. The larger percentage of maxillary sinusitis associated with frontal sinusitis may be accounted for in the greater severity of the nasal inflammation, all being severe cases of influenza. In thirteen of the thirty-four unilateral cases, the antrum was irrigated but once, the shadow growing less and disappearing after three to seven days. In these cases there was probably but slight thickening of the mucosa, the antrum being mainly a reservoir for the pus from the frontals and ethmoids. In the other twenty-one cases the original shadow was darker and the antrum irrigated two or more times, the greatest number in a girl of sixteen who was irrigated every other day for two months. The seventeen cases of bilateral fronto-maxillary-sinusitis all had their antra irrigated more than once. The antrum was therefore involved in fifty-one cases of the fifty-eight.

Ethmoiditis was considered to be present when considerable swelling was found in the region of the bulla and posteriorly. In forty-seven cases the swelling was marked and ethmoiditis considered present. In twenty-six cases the sphenoid was involved as determined by irrigating the cavity. In the seventeen bilateral frontal cases, both sphenoids were involved in eight, the right sphenoid in two and the left in three, making thirteen cases in all. Of the remaining thirteen cases complicating the forty-one unilateral frontals, the right sphenoid was involved eight times and the left five times.

Prognosis. We feel confident that many cases of acute frontal sinusitis occur, fail to be diagnosed, and yet get well without any special treatment directed to the nose or sinus. Many of the chronic cases, provided the disease has not existed too long, can recall the beginning of their trouble, the intense suffering for a week or so, and then the discharge or "catarrh" as they term it, persisting till the true condition is discovered. Of the fifty-eight cases, fifty-five (95 per cent.) made complete recoveries as a result of intra-nasal treatment. One case treated intra-nasally died within twenty-four hours after I saw him. Two cases were operated on by the external method, one of which, a desperate one with beginning meningitis, died forty-eight hours later of meningitis and sepsis. The other recovered. One case (not included in the series)

diagnosed as frontal sinusitis proved to have no sinus—she recovered.

So far as known only one case among the fifty-five had a return of the disease, in February, 1905, accompanying an attack of the gripe.

The average duration of treatment was nine days, the shortest four days (stopped treatment when pain ceased). The longest was under observation for two months on account of an associated acute maxillary sinusitis, the frontal discharging for five weeks at least, and possibly a little longer.

TREATMENT.

Constitutional. Patients suffering from acute frontal sinusitis should remain indoors and be given such drugs as would ordinarily be used in abating the general infection, as for example, influenza of which the sinusitis is but a complication. Quinine in suitable doses, salol or aspirin, belladonna or atropin pushed to their physiological effect have all proved serviceable in these cases. In the earlier stages of the inflammation a drop of aconite repeated every fifteen minutes until profuse perspiration has been produced often relieves the turgescence in the nose and favors drainage. Calomel followed by the salines for evacuation of the bowels should be given in all cases. The coal tar analgesics such as phenacetine, antipyrin, etc., had frequently been prescribed by the family physician for the pain, but seldom afforded much relief.

Opium and morphine, it seems to me, are contra-indicated in these cases just as much as in acute mastoiditis, for in alleviating the pain they mask the fact that the secretion may still be under considerable tension with insufficient drainage, and lure the patient and physician into thinking the condition is improving, whereas it may be getting so decidedly worse as to be of considerable danger to the life of the patient.

External Local Treatment. External applications of moist heat, by cloths wrung out in very hot water, not infrequently contract the blood vessels of the mucous membrane in the frontal sinus and its duct so as not only to diminish secretion, but to increase the caliber of the canal and afford better drainage for the secretion, which has accumulated in the sinus. This form of heat has almost always proved agreeable, giving great relief. Occasionally cold applications in the shape of ice cloths or an ice bag to this region will produce the same re-

sults on the blood vessels as that usually produced by heat. Cold, however, is not usually so well borne as heat.

Internal Local Treatment. The first consideration on the part of the physician should be the establishment of adequate drainage from the sinus. In a large percentage of cases the obstruction lies in the lower portion of the naso-frontal duct where it opens into the middle meatus, from the swelling of the nasal mucosa in this region. In the milder cases solutions of adrenalin 1-10,000 sprayed into the nose every two hours not only contract the mucous membrane here, but also that over the middle turbinate, to such an extent as to afford satisfactory drainage. In some cases adrenalin does not produce the effect desired, and one may then have recourse to spraying the middle meatus, beneath the inferior portion of the middle turbinate, with a 2 per cent. solution of cocain. In recommending this, however, I fully realize the danger of the patient contracting the habit if he were allowed to use it himself. A trained nurse or some member of the family alone should be entrusted with the cocain spray, with instructions to use it only so frequently as may be necessary. When the nasal mucous membrane has been contracted by the adrenalin or adrenalin and cocain the nose should be syringed with a solution of sodium chlorid and sodium bicarb. nate, a tea-spoonful of each to the pint of sterile water at a temperature of about 115 degrees Fahrenheit. Most patients stand this temperature very well. The first syringe full will be considered pretty warm, but the subsequent ones will not be complained of, and the contracting effect on the blood vessels of the hot alkaline, saline solution is most beneficial. We have often found that spraying the nose with an oil spray—Menthol grs. xv, Camphor grs. x, Oil pini pumilionis m. vii, Benzoinol q. s. ad oz. ii, keeps the nasal mucous membrane contracted and induces a serous flow from the mucosa which greatly helps in diminishing the obstruction around the lower portion of the naso-frontal duct. Steam inhalations where the nose is very greatly obstructed will do the same as irrigation, but of the two I prefer the irrigation, as it removes the secretion at the same time that the local effect of the heat is obtained. Should the above procedures not suffice in establishing good drainage from the frontal sinus as evidenced by the continuation of the pain after twenty-four hours, or should any of the symptoms enumerated under VI, VII, VIII be present at the first visit of the patient,

no time should be lost in removing the anterior third of the middle turbinate so as to uncover the region of the lateral wall of the nose into which the naso-frontal duct opens. One should never forget that the naso-frontal duct does not open constantly at any one place in the nose; it is sometimes situated well forward, at others as far back as the middle of the middle turbinate. The amount of tissue that will have to be taken away will therefore greatly depend upon the position of the naso-frontal duct. The mere taking away of a small portion of the anterior end of the middle turbinate, unless it happens to expose the naso-frontal duct, is of little value. The snare alone does not remove enough of the middle turbinate to be of much value; a pair of forceps—Myles' nasal cutting forceps are the ones we prefer—should be inserted high up, one blade each side of the middle turbinate so as to excise the anterior third of the attachment of the middle turbinate to the outer wall of the nose. The snare then inserted through this cut area will remove the offending portion in a large majority of cases. The bleeding, if the parts are thoroughly cocaineized and adrenalized, is seldom very great at the time of operation. By insufflating some powdered suprarenal gland what little hemorrhage there is can be checked in the course of two or three minutes. If now we irrigate the nose with hot normal saline the powder will be removed, together with the blood clots, so that inspection will enable us to determine whether we have removed enough of the middle turbinate to uncover the naso-frontal duct; if not, Grunwald's punch forceps, Myles' punch forceps, or some of the other types of forceps used for intra-nasal work should be used to remove enough more of the middle turbinate to afford adequate drainage. Should, as occasionally happens, small polypi be found beneath the middle turbinate, they are best removed with the forceps, as it is these, often times, which are the offending bodies in blocking drainage. In cases where polypi are found in the middle meatus, it is our belief that we have to deal in most cases not with an acute frontal sinusitis, but merely an acute exacerbation of a mild frontal sinusitis that has existed some time.

External Operative Treatment. Whenever the intra-nasal treatment of acute frontal sinusitis does not succeed in establishing adequate drainage through the naso-frontal duct, then it becomes necessary to open into the frontal sinus through the

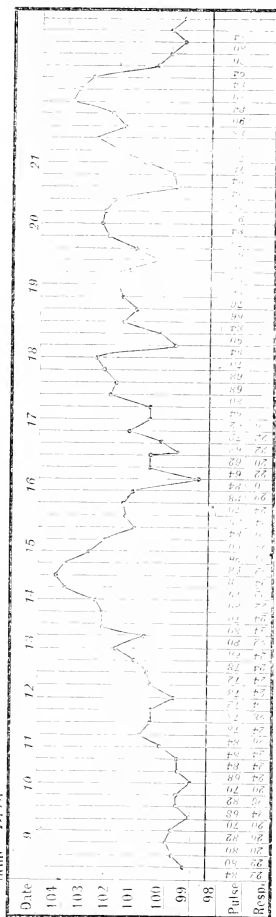
anterior or inferior wall. Certain symptoms and signs justify us in performing this operation.

These are:

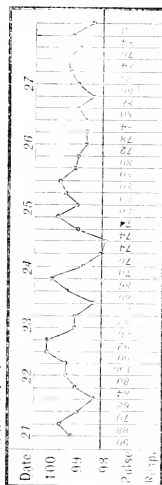
Marked bulging of the inferior wall of the sinus with evident pointing, as if the contents were about to be evacuated. Oftentimes one sees a lesser degree of bulging which subsides when intra-nasal treatment is vigorously carried out. If, however, symptoms of meningeal irritation exist or meningitis has begun, or if actual displacement of the globe of the eye with diplopia obtains, or if, accompanying the headache there is marked dizziness and vertigo, it seems to me we are justified in urging external operation. I wish, however, to state that these symptoms in acute cases are infrequent. On account of the associated eye symptoms and the disturbance of vision, patients often apply to an oculist rather than to a rhinologist for treatment. Each man will have to be a judge for himself as to when he shall operate in these cases. My experiences with such severe cases have been four:

Miss B. S., age 30. Seen on January 28, 1903. Had had severe grip for five days with considerable discharge from both nasal cavities, more on the right; marked supraorbital pain on the right, none on the left. Two days ago developed pain in right ear. Examination showed the right membrana tympani red and bulging; slight tenderness over mastoid antrum; considerable muco-purulent discharge from right middle meatus; septum deviated to right so as to preclude view of right middle turbinate. Great tenderness on percussion over the right frontal area and orbital plate. Under nitrous oxide anesthesia, paracentesis of right membrana tympani; smear made from discharge revealed diplococcus of pneumonia. Temperature 100.4, pulse 80. Until February 2nd patient ran a slightly irregular temperature, varying from 99 to 101, pain over right forehead became more intense, with slight edema of the upper eyelid. On account of deviation of septum impossible to do more than keep the mucous membrane contracted with adrenalin and cocaine; mastoid pain also slightly increased, discharge fairly profuse; ear irrigated every two hours with boric acid. On February 2nd temperature gradually rose to 102, frontal headache increasing to such an extent that the patient begged to have something done to relieve it. Hypo of $\frac{1}{4}$ grain of morphin gave but little relief. On the afternoon of February 3rd, the temperature was 103.8, pulse 90.

Name B. S.



Name B. S.



respirations 28. At 5 o'clock of the same day, the temperature was 105.6, pulse 110, respiration 24. Pain over the right forehead had increased as also the tenderness over the mastoid. Patient begged to have something done for the relief of pain. It was decided to open the right frontal sinus externally. On exploring the right frontal region, absolutely no trace of a sinus could be found; the diploe was found to be soft and bled profusely. Although we explored towards the nose to the level of the inner canthus of the eye, exposed the posterior table of the frontal, went outward to the middle of the orbit and inferiorly to the roof of the orbit, no right frontal sinus could be found in this region. The left frontal sinus was found to extend in a tongue like projection, one-fourth inch to right of median line, three-eighths of an inch above the glabella. The mucous membrane lining it was perfectly healthy, no secretion in the cavity. A probe could be passed through this cavity down the left naso-frontal duct into the nose. The frontal wound was packed, A separate piece of gauze was placed across the opening made into the left frontal sinus.

Dr. Robert Lewis, Jr., operated on the mastoid, finding but a few cells involved near the tip which were filled with gelatinous infiltration of the mucous membrane and scarcely any secretion. Patient's temperature fluctuated between 105½ and 99 until February 9th, it then ranged between 99 and 100 for two days, when it gradually rose again until February 13th, when it reached 105.2. At this time the patient developed a slight broncho-pneumonia. The temperature ranged in the succeeding days, until February 18th, between 100 and 103 and gradually rose until February 20th, when the temperature reached 104. During all this time the mastoid was healing in the usual way. Cultures taken from this wound were sterile. There was the usual discharge from the frontal wound, cultures from which showed streptococci. There was no discharge from the left nasal cavity to indicate that the left frontal sinus had been infected during or subsequent to the operation. The discharge from the right nasal cavity ceased five days after the operation. The patient was seen several times by Dr. Robt. Lewis, Dr. Weeks, who examined the eyes with negative results, Dr. W. Gilman Thompson and Dr. Robt. Carlisle. We all felt that there was some other suppuration which had not as yet been discovered. On account of the persistent headache in the left frontal region we suspected an abscess in the frontal

lobe of the brain. We decided to wait for more localizing symptoms before operating further. On February 21st the temperature rapidly dropped to 99.6, fluctuated between 98.6 and 100.4 for three days when it became normal and remained so. The mastoid wound healed in six weeks, the frontal in seven weeks. The patient recovered and is well at the present time. In this patient every indication pointed towards frontal sinusitis but we are unable to explain the symptoms preceding operation except on the hypothesis of intense congestion without apparent suppuration in the diploë in the right frontal region. Had we been able to take a skiagraph of this patient's head prior to operation, she would probably never had been operated upon for frontal sinusitis.

Case II—For the history of the second patient I am indebted to Dr. Robert Lewis, Jr., with whom I saw the patient in consultation. S. W., age 35. First seen on June 2nd, 1903, by Dr. Lewis. Had profuse discharge from the left side of the nose for the previous three weeks, pain and swelling of left cheek and both lids of the left eye. Gave a history of syphilis. June 3rd, Dr. Lewis opened the maxillary antrum through the canine fossa. The cavity was filled with granulation tissue and pus; necrosis of the entire floor of the orbit and wall of the left nasal fossa. All the bone of the floor of the orbit above the antrum was removed; temperature 102 4-5, pulse 128. Temperature fluctuated on June 4th, 5th and 6th between 101-8 and 99.6, pulse about 100. One June 7th, temperature rapidly rose from 100 to 105 2-5. On June 8th, exophthalmos, very intense pain in left eye; upward and inward movement of the eyeball interfered with, diplopia; temperature 103, pulse 116. On June 9th, temperature again rose to 105, pulse 120. On this date I saw the patient with Dr. Lewis and advised opening the frontal sinus and ethmoidal cells. This was done. The whole lower portion of the frontal sinus was necrosed exposing the periosteum of the orbit; the ethmoidal cells were also badly necrosed, thoroughly opened and curetted. At the time of the operation, 10 p. m., the patient was slightly delirious. On the morning of the day after the operation, June 10th, the temperature dropped to 100 and rapidly rose after a chill to 106 at noon. At 6 p. m. it dropped again and rose with a second chill at 8:30 to 105.8, pulse 144. Meningitis more pronounced, rigidity of the neck. Patient died on the evening of June 11th from basilar meningitis and

general sepsis, the point of infection for the brain being probably from the orbit. The cause of the extensive unusual amount of necrosis was probably in great part syphilitic. It was a desperate case for operation and yet that seemed to offer the only possible chance for recovery.

Case III.—Master W., age 17. Healthy specimen of a boy with no previous history of any nasal discharge. While at dinner at 7 p. m. on December 12th, 1903, complained of intense pain back of the left eye. Was unable to finish dinner; lay down and physician summoned who prescribed analgesics without relief. On the 13th pain increased, slight discharge from left nasal cavity, none from right; adrenalin spray prescribed by family physician; morphin administered, pain no better. On December 14th, patient seen by Dr. A. A. Smith, who asked me to see patient in consultation with him. Saw patient at 12:30 noon that day and found considerable discharge from the left nasal cavity, great tenderness on percussion over the frontal and on pressure over the orbital plate of the left frontal. Edema and ecchymosis of the left upper eyelid. Transillumination—left frontal very dark, right frontal clear, left antrum clear. Cocainized left middle meatus and removed the anterior one-third of the left middle turbinate with forceps and snare; about 20 drops of pus followed the excision. Pus seen posteriorly between middle turbinate and septum; this was wiped away. Canula passed into the sphenoid and half dram of pus washed out of the left sphenoidal cavity. Headache somewhat relieved for next three or four hours. Six p. m., patient's eyes examined by Dr. Weeks, who found nothing abnormal in the fundus. Temperature 102, pulse 60. At 10 p. m., headache had returned, temperature 103, pulse 50. December 15th, 7 a. m., the boy was unconscious, pulse 40, neck rigid; died at 11:20 a. m. This case illustrates a most intense type of infection of the meninges, probably occurring early in the course of the sinusitis. As the frontal, ethmoid and sphenoid were all involved, it was impossible to determine which of these was the more responsible for the infected meninges. Unfortunately no culture was taken from the pus to determine the variety of bacteria. Had not Dr. Weeks been so positive about the fundus being normal I should have opened his frontal sinus externally on the evening of the 14th. Had I operated and the end come as rapidly as it did, I would have felt that some fault in technique might have caused the early death of the patient.

Case IV.—F. A. McG., age 24. First seen on March 26th, 1904. The week previous contracted a severe cold in the head with considerable discharge from the left nasal cavity, none in the right. Four days ago had swelling of the left upper eyelid, great headache, supraorbital and vertical. Examination—large quantities of pus in left middle meatus, none in right. Transillumination of right frontal sinus showed small area of illumination, left did not illuminate at all. Right antrum brilliant, left absolutely dark. Irrigated nose with normal saline, punctured and washed out large quantity of pus from left antrum. Removed anterior one-third of left middle turbinate; considerable pus followed the removal; smears from this were examined and showed staphylococci. March 27th, left nasal discharge profuse, swelling of eyelids considerably less. March 28th, edema of eyelids lessening, pain greatly diminished but with considerable discharge from the nose. Again irrigated antrum and washed out considerable quantity of pus. March 30th, pain over eye slightly increased, discharge from nose less. April 1st, much less discharge from nose, only slight pain in the morning, swelling and ecchymosis of eyelid practically disappeared. Transillumination—left frontal sinus same as last time, antrum slightly clearer. April 4th, discharge only slight; examined microscopically showed staphylococci and pneumococci. Left frontal dark, left antrum same as last examination. April 5th, left eyelid very edematous, could scarcely see out of eye; marked bulging of orbital plate, slight diplopia, considerable discharge from nose, great pain over eye. Operation at 4:15 p. m. Usual incision through whole length of eyebrow. Mucous membrane almost black in appearance. On passing probe into cavity, thick muco-pus exuded under pressure, considerably more than half ounce escaping. Opening was enlarged and cavity found to extend to the left to the external angular process. An incomplete septum in the median line was found. The skin incision extended across the median line to the inner one-third of the right eyebrow. Bone over the right side of the sinus removed. A slight depression found in the region of the normal position of the right naso-frontal duct but no communication with the right naris. A very large orbital offshoot extended over the left orbit practically the entire depth. Mucous membrane entirely removed and cavity packed with gauze. Patient made slow but uninterrupted

recovery, the antrum being washed out but once after this, on April 18th. The frontal sinus did not completely heal until February 22nd, 1905. There has been no discharge from the nose since May 5th, 1904. The long healing in this case was undoubtedly due to the enormous size of the sinus.

CHRONIC SUPPURATIVE FRONTAL SINUSITIS.

We have never observed a case of chronic suppurative frontal sinusitis that was not accompanied by a similar condition in some of the adjacent accessory sinuses. There has always been an associated ethmoiditis. In a large percentage of cases the antrum has contained pus, sometimes without much pathologic change in the mucous membrane, at which time it is probably merely a reservoir for the secretion pouring down from above; at other times the mucous membrane of the antrum has been greatly thickened and polypoid owing to chronic inflammation. The sphenoid is also frequently involved, but not nearly so often as the antrum. As a result of the involvement of the adjacent sinuses, the symptoms and physical signs present a complex picture.

DIAGNOSIS.

The diagnosis of chronic frontal sinusitis, like that of acute, is based upon the symptoms given by the patient and the examination of the physician. The former rarely points so directly to the involvement of the sinus as in acute cases, consequently the examination plays a far more important role.

SYMPTOMS.

Discharge.—Discharge in chronic frontal sinusitis, or “catarrh,” as the patients usually term it, varies considerably in amount with the size of the sinus but it is far more dependent upon the number of the accessory sinuses which are simultaneously involved. If the frontal and ethmoids alone are involved, the discharge is not usually very profuse; if the antrum is also involved, the amount is greater, the bulk of which, of course, comes from the antrum. In character it is almost invariably a pure purulent discharge, which if examined microscopically, will be found to consist of pus cells and their broken down detritus. If putrefactive organisms have gained access to the cavity, the discharge has an odor of sulphureted hydrogen. This, however, is not so common with the frontal sinus as it is in the associated disease of the antrum. From the dis-

charge alone as described by the patient, it is impossible to make a diagnosis of frontal sinusitis.

2. *Frequent taking cold.*—A very large percentage of these cases have moderate acute exacerbations several times a year, and they call such attacks "colds in the head." The pharyngolaryngitis accompanying ordinary rhinitis is often absent.

3. *Fullness in the frontal region. Pain.*—Most patients complain of a feeling of fullness in the region of the frontal sinus which is aggravated by intense mental application. During the time when they have acute exacerbations, their taking cold periods, this fullness is more marked and in many amounts to a dull pain. It is seldom the neuralgic pain that occurs in acute sinusitis.

4. *Dizziness and Vertigo.*—These two symptoms are occasionally noticed and I am at a loss to know whether the symptom is due to the frontal sinus disease alone or more frequently to the ethmoid and sphenoidal sinusitis which so frequently is present.

5. *Kakosmia and Anosmia.*—Kakosmia, or the subjective sense of bad odor in the nose, is present in a moderate number of cases. It has been present when I have been unable to detect any odor in the secretion wiped away with an applicator. Anosmia is often present when the nose is obstructed with polypi or intense hypertrophy of the mucous membrane of the middle turbinate.

6. *Edema and Redness of the Upper Eyelid and Bulging of the Orbital Wall of the Frontal Sinus.*

7. *Diplopia.*

8. *Fistula Formation.*—These have all been observed in a few cases and are usually evidence of acute exacerbations of a chronic suppurative process, accompanied by marked obstruction to the outlet of the pus through the naso-frontal duct. They have been more fully described under acute frontal sinusitis.

EXAMINATION.

1. Examination of the nose on the affected side usually reveals the presence of pus in the middle meatus between the middle turbinate and septum. It has frequently occurred in our practice that on the first examination of the patient, no secretion has been visible, owing to the fact that it is quite common for a patient to blow his nose on entering one's office and thus entirely rid himself of the accumulated secretion. In this

way we have at first overlooked the disease, when a subsequent visit revealed the secretion in this region, and led us to investigate the accessory sinuses. As in acute cases pus in this region may have come from the frontal sinus, antrum or anterior group of ethmoidal cells. The same means of differentiating are to be taken in chronic cases as already given in the acute ones. Postnasal examination has occasionally discovered pus over the end of the inferior turbinate when none was visible anteriorly; this has been the means of our investigating and discovering sinus disease when the patient's history would not have led one to suspect it.

2. Multiple polypi in the nose should always cause the investigator to make careful search of the accessory sinuses. With but one exception during the past two years, investigation has proved that patients with polypi have had accessory sinus disease, not always, however, of the frontal sinus.

3. Percussion over the frontal sinus is seldom painful except during an acute exacerbation of the chronic sinusitis.

4. Pressure on the orbital surface of a diseased frontal sinus has in almost all cases been more sensitive than similar pressure on the healthy side. I regard tenderness on pressure over the floor of the frontal sinus as a valuable sign pointing towards a chronic inflammation within the cavity.

5. *Transillumination.*—Transillumination of a diseased frontal sinus will in many cases show a markedly smaller area and far less perfect illumination than on the healthy side. Frontal sinuses vary considerably in size and a smaller area of illumination is always to be expected when the sinus on one side is smaller than on the other, so that differences in illumination alone are not of too great diagnostic importance. If, however, the illumined area is more of a cherry red color than the brighter pink that one sees in a sinus filled with air, the value of trans-illumination is enhanced.

6. *Probing the Frontal Sinus.*—In cases of chronic frontal sinusitis a probe can in a large percentage of cases (in 101 of the 113 sinuses here recorded) be passed up the naso-frontal duct and into the cavity of the sinus. It is more easily accomplished if polypi are associated with frontal sinusitis, as the middle turbinate is almost always pushed well over towards the septum leaving abundant space between the middle turbinate and the septum for the passage of a probe as soon as the larger polypi have been removed.

In cases unassociated with polypi, the middle turbinate usually hangs so close to the outer wall that it is a considerable hindrance if not an absolute impediment to the passage of the probe. We may often overcome this difficulty by taking a Killian's long speculum which is inserted between the middle turbinate and the outer wall, the parts being thoroughly cocainized, and the blades opened. The middle turbinate is thus sprung towards the median line leaving sufficient space for the passage of the probe. As, however, the preliminary step in the intranasal treatment of such cases is often the removal of the anterior portion of the middle turbinate so as to do away with the immediate obstructing medium, we frequently excise the anterior end and a few days later have little difficulty in passing a probe into the sinus. The proper curve for the probe varies slightly with individual cases but the one here shown with slight increase or diminution of curvature will be found to pass fairly readily. The length of the probe when within the frontal sinus, measured from the tip to the point where the probe passes over the entrance of the vestibule of the nose at its junction with the tip, varies from 8 to $9\frac{1}{2}$ centimeters. Anterior ethmoidal cells may open alongside of the outlet of the naso-frontal duct and extend upwards towards the root of the nose alongside of and parallel with the naso-frontal duct. It is possible for a probe to enter one of these cells and for the examiner to believe that he is in the frontal sinus when in reality he is in one of the ethmoidal cells. If the precaution, however, be taken to notice the distance and direction that the probe has penetrated, and lay it on the face at the same angle as it lay in the nose, there are few times when one will thus be deceived by a fronto-ethmoidal cell. As a usual thing, a small amount of secretion is forced out of the frontal sinus while the probe is being passed. In a normal frontal sinus when a probe has touched the anterior wall, as it usually does, the sensation is very much the same that would be derived if the probe were passed over a smooth wooden surface. The mucous membrane is so thin that the impression of a hard surface is given. On the other hand in chronic frontal sinusitis with a thickened mucous membrane, the tip of the probe enters a pulpy mass, the feeling of which is not unlike that which is derived on thrusting a probe into a piece of velvet.

7. *Irrigation*.—Once a probe has been inserted into a frontal

sinus it is easy to bend a flexible silver canula of small caliber to conform to the curvature of the probe and pass it into the sinus. By bending the head forward, sterile normal saline may be injected by a syringe into the sinus and the returning fluid caught in a clean black pus basin held below the chin. If all secretion has first been removed from the nose by irrigation and the region wiped clean beneath the middle turbinate with pledgets of cotton, it will be found that ordinarily but a few shreds of muco-pus are washed out of a diseased sinus. The reason for this is that the enormously thickened mucous membrane nearly fills the cavity so as to leave but little space for the accumulation of secretion. One, therefore, need not be chagrined at the small amount of secretion that comes away, or delude himself into thinking that the disease is not very extensive and will readily yield to local treatment.

8. *Skiagraphy*.—Skiagraphy is one of the most valuable diagnostic aids that we have in diseases of the frontal sinus. It enables us to determine the height and breadth of the cavity, the position of the septum between the two, and most if not all the subsidiary, incomplete septa so frequently existing. It will often show us the recess which extends back over the roof of the orbit to a greater or less distance. In a number of the plates which I have had the cloudy outline of the diseased frontal sinus as compared with the clear distinct outline of the healthy sinus left no doubt as to which of the sinuses was diseased. Unfortunately not all the negatives have been sufficiently clear to make the latter point one that can be invariably relied on.

INTRANASAL TREATMENT.

Intra-nasal treatment of chronic frontal sinusitis will be anything but satisfactory unless we bear in mind the probable involvement of the neighboring sinuses. The ethmoids are of the first importance and next the antrum. The sphenoid from its position rarely directly affects the frontal suppuration, but only indirectly through the ethmoids. The antrum should be widely opened in the inferior meatus. The sphenoidal ostium widened and the anterior ethmoidal cells freely opened with the various forceps such as Grunwald's, Myles', etc. Polypi, if present, must be removed as thoroughly as possible. If the middle turbinate renders access to the naso-frontal duct difficult or impossible, remove so much of its anterior

end as may be necessary with forceps and snare. But little surgical work can usually be done in the middle meatus more frequently than once a week or ten days as the inflammation consequent on each surgical procedure renders the part quite sensitive, the absorption of cocain is less free, the pain too great for the patient to bear, and the hemorrhage obscures the operative field. The treatment necessarily is slow and tedious. The next step is to pass a probe into the frontal sinus to determine the position and course of the naso-frontal duct. Unless the cavity can be entered by a probe, any attempt at enlarging the naso-frontal duct is fraught with so great danger to the patient as to be absolutely condemned. The forceps and curette may in such cases readily be pushed upwards through the ethmoid cells and cribriform plate into the cranial cavity and carrying infected material cause a fatal meningitis. A curette, made to follow the course of the probe, is employed to tear away the thickened membrane at the lower part of the naso-frontal duct. The shreds are to be cut away with forceps. If the curette is made to cut forward and inward there is little danger. Curetting outward may result in penetrating the cavity of the orbit and setting up a cellulitis with all its possible consequences. Curetting posteriorly while safe near the outlet of the duct becomes more dangerous the higher we go from liability to penetration of the cranial cavity. The bleeding is always annoying and sometimes considerable. Pledgets of cotton soaked in adrenalin packed into the region usually control it. If on removal, the oozing recurs so as to obscure the field, desist for the day, as blind curettage through a bleeding field is *unsafe*. The object to be attained is the dilatation of the naso-frontal duct so as to establish good drainage and an easy passage for a good sized canula, about a No. 3 Eustachian catheter. If attained, some patients may, after the soreness has subsided, be taught to catheterize and irrigate their own sinuses. A 20 per cent solution of argyrol has seemed to aid in diminishing the secretion. Any one not thoroughly familiar with the anatomy of the sinuses as acquired by considerable study and practice on the cadaver would be unwise in undertaking the dilatation or curettage of a naso-frontal duct.

RESULTS OF INTRANASAL TREATMENT.

My statistics of the intranasal treatment of chronic frontal sinusitis are incomplete, owing to the fact that many of the

patients have been lost sight of. Seventy-nine cases have been treated in this manner. Eleven, or 14 per cent, are considered as cured. They have been seen for two years, at least, after the cessation of all discharge. Most of these patients have had one or more attacks of rhinitis, from which they have recovered. Following these attacks, there has been no discharge from the frontal sinus. Of the remaining 68 cases, 27, or 35 per cent, have been lost sight of. Some of them still had a slight discharge when last seen. Whether these cases are cured, or have passed into the hands of fellow practitioners, I have been unable to ascertain. Of the remaining 41 cases, 24, or 30 per cent, have returned, with recurrences, one or more times a year. Twenty-two of these cases have polypi, which recur at intervals, varying from six months to two years. They are satisfied with the improvement obtained, as the result of the removal of the polypi, and the diminution of secretion from the frontal and other accessory sinuses. Seventeen of the 41 cases, or 21 per cent, after having been under treatment for a period varying from six weeks to three years, finally submitted to a radical operation by the "open method." All have been cured.

To recapitulate, 14 per cent were cured by conservative treatment, 51 per cent improved, and in 35 per cent the result is unknown.

EXTERNAL OPERATIVE TREATMENT.

The indications for operating upon the frontal sinus by some of the well-known methods, are:

First.—Chronic suppurative frontal sinusitis, associated with multiple polypi formation in the nose. These cases are always combined with an ethmoiditis. The intranasal removal of the polypi, curettage of the ethmoids, dilatation of the naso-frontal duct, and irrigation of the frontal sinus, ameliorate the symptoms for a few months. In a large percentage of cases, the polypi and symptoms recur, and some form of treatment must again be instituted. In elderly people, or those with marked organic lesions of the heart, lungs or kidneys, a radical operation may be inadvisable. To all other patients, a radical operation is proposed, if they desire to be permanently rid of their disease.

Second.—A radical operation is indicated in severe acute exacerbations of the chronic disease, whenever any of the graver

symptoms, as mentioned in VII, VIII, IX or X, of Acute Frontal Sinusitis, develop.

Third.—If intranasal treatment of a frontal sinus does not suffice to prevent the discharge from passing to the antrum, and the odor and taste of the fetid discharge from the latter, annoy the patient, then, in order to cure the antrum, the frontal sinus must be operated upon radically.

Fourth.—Very large frontal sinuses, with multiple septa, particularly those with recesses extending back over the roof of the orbit, can be but imperfectly irrigated. Until recently, we have had no means of ascertaining these facts. Skiography, however, as now practised, will give us the exact height and breadth of the frontal sinuses, indicate the number and position of the septa, and, in many cases, inform us of the presence of an orbital recess. The radical operation should be advised for such patients.

Fifth.—Patients with narrow nasal cavities offer greater difficulty in carrying out intranasal treatment, than those with more patent nares. When the drainage is poor and headaches frequent, these patients gladly submit to a radical operation.

Sixth.—There is a large class of patients, living at some distance from the larger cities, who journey thence to get relief from their suppuration. Considerable sacrifice is entailed in their absenting themselves from home and business. They desire to be cured, and that as quickly as possible. Intranasal treatment is slow, and the results uncertain. A radical operation may take as long to affect a cure, but when obtained, it is permanent.

Seventh.—The neurasthenic patient, who is prostrated each time intranasal treatment is attempted, and rarely submits to enough being done at any one time, to make much progress, is more satisfactorily treated by the radical method. There is seldom any pain after the second dressing, by the latter method.

Eight.—If a fistula is formed, leading into a frontal sinus, a radical operation is the only treatment likely to effect a cure.

My experience with radical operations on the frontal sinus has been limited to two types of operation.

OGSTON-LUC OPERATION.

I have performed this operation upwards of twenty-five times. In fully half the cases the patients had a recurrence of

the sinusitis, when polypi recurred in the nose, or after a more or less severe attack of acute rhinitis. The deformity, in this type of operation, is practically only a linear scar, which after a few months, is scarcely visible. The objection to the operation, is the great number of recurrences, owing to the fact that the mucous membrane in the frontal sinus is not removed, and the cavity remains lined with a secreting membrane, which participates in all the acute inflammations that occur in the nose. While the naso-frontal duct is at first widely dilated, constrictions occur at or near its lower end, which necessitate either intranasal operations for relief, or a second radical operation. My belief is that the Ogston-Luc operation gives the patient but little better chance for complete recovery than does an intranasal operation.

In seeking for a better operation, my attention was called to Kuhnt's method. This, as originally proposed, consisted in removing the entire anterior wall of the frontal sinus, thorough removal of the mucous membrane from all parts of the cavity, and the exposure and removal of the mucous membrane from the ethmoidal cells surrounding the naso-frontal duct. He then inserted a drainage tube through the duct into the nasal cavity, and closed the external wound, so that secretion during the process of healing, should find its way through the drainage tube into the nasal cavity. Having in mind the mastoid operation, it occurred to me that it were better to omit nasal drainage and closing of the frontal wound, and try to accomplish that which is so well done in the mastoid, of allowing the granulations to fill the lower portion of the naso-frontal duct, and to keep the upper portion packed with gauze until the cavity is completely obliterated. By so doing, one keeps the healing process entirely under the eye, and when the healing is accomplished we feel confident that the sinus is obliterated, and cannot be infected from the nose with every attack of acute rhinitis.

Before resuming the method, which is best known as the "open method" of operating, mention should be made of Killian's operation. You are all perfectly familiar, as I am, with the technique. I have performed it, as he describes it, several times upon the cadaver. The testimony from those who have witnessed the operation, varies as to the amount of deformity which is left by this procedure. The results of the "open method" have been so satisfactory, that I have not as yet, attempted the Killian operation upon any of my patients.

THE OPEN METHOD.

The patient is anesthetized beginning with nitrous oxid, followed by ether. If asthma or chronic bronchitis are very marked, chloroform is preferred. The skin over the forehead and rest of the face is sterilized by scrubbing first with green soap, and later washed with bichlorid, followed with alcohol and ether. In performing this, care must be taken to protect the eyes with a pledget of sterile gauze to prevent the various solutions getting into them and setting up a disagreeable conjunctivitis. A wet bichlorid towel is placed around the head so as to include all the hair and yet leave a large area of the forehead uncovered for purposes of manipulation. The best position for the operator is that directly behind the patient; the assistant who holds the retractor should be on the operator's left when the right frontal sinus is operated upon and on the right when the left cavity is operated upon; the assistant who sponges, stands on the opposite side of the operator to that of the one holding the retractor. The eyebrow is not shaven.

The incision begins at the junction of the nose and eyebrow, extends outwards, splitting the middle of the eyebrow and terminating in the outer quarter. It is most convenient to make the primary cut extend through the skin, fascia and muscular tissue down to the periosteum. Considerable bleeding is usually encountered at this point, but may be kept well under control if the finger of the disengaged hand of the operator is placed on the supraorbital artery before it enters the notch in the arch of the orbit. The periosteum is next incised, a quarter of an inch above, and parallel to the orbital arch. With an elevator the periosteum is denuded upwards for a space of an inch and down to the edge of the orbital arch. All blood vessels and bleeding points, usually from four to eight in the lower margin of the wound, are picked up with artery clamps; one or two clamps may have to be used on the upper surface of the wound. The vessels are immediately ligated, in order to prevent the artery clamps from pressing upon and injuring the ball of the eye. There should now appear the bare surface of the frontal bone exposed for a distance transversely of at least an inch and a half and vertically for an inch and a quarter. Blunt retractors should be used to keep this much of the wound exposed. With a Killian V-shaped chisel a groove is made in the bone on the anterior wall of the sinus

parallel with the arch of the orbit and one-sixteenth of an inch above it. Above this line one may remove the anterior bony wall extensively without great deformity, but if the bone below this is removed and the arch notched or destroyed, considerable deformity always follows. With gouge and mallet the anterior wall of the frontal sinus is grooved parallel to the aforesaid line and just above it beginning at a point near the nasal end, extending it to the middle of the orbital arch. By gradually deepening this groove and exercising care, one can usually expose the mucous membrane lining the frontal sinus without wounding the latter. When the mucosa has been exposed through an area one-fourth of an inch in diameter, the Cozzolini forceps are introduced into the cavity above the mucous membrane and the bony opening enlarged sufficiently to admit a bone forceps, such as Pyle's, Bacon's or any of those commonly used in a mastoid operation. With the exercise of a little care, the entire anterior wall of the frontal sinus may thus be removed without injuring the mucous membrane. Should any doubt exist as to the necessity for doing the radical operation, the first opening need not be made so large as this; the mucous membrane lining the cavity should be incised to determine its thickness and the contents, if any. The normal mucous membrane is about one-twenty-fifth of an inch in thickness. A diseased mucous membrane may be as much as $\frac{3}{8}$ of an inch thick. One does not always find secretion in a frontal sinus thus opened because the space in the sinus is very much diminished as a result of the enormously thickened mucous membrane. The manipulative processes of keeping the field clear of blood by sponging and the pressure of the forceps often force whatever small amount of secretion may have been in the cavity through the naso-frontal duct into the nasal cavity. A probe is now used to explore all the periphery of the sinus for incomplete septa and the various pockets which so frequently exist. With a curette the mucous membrane in the body of the cavity is removed as far as the middle of the naso-frontal duct. A small pledget of gauze packed into the duct prevents hemorrhage below from obstructing the field of operation. All ridges, bony septa, and the margins of the sinus should be smoothed off and careful search made for any further inequalities in shape in the sinus. The margins of the bony wound should be smoothed by curettes so as to bevel from above downwards, no rough portions remaining. At-

tention should next be directed to removing the mucous membrane from the naso-frontal duct; this can only be accomplished by the aid of artificial illumination, and the small lamps designed by the author, with the lens front, have served him better than any other form of illumination. It is the naso-frontal duct and the ethmoidal cells immediately surrounding it that demand the closest attention on the part of the operator; it is comparatively easy to completely remove the mucous membrane from the main portion of the frontal sinus; it is a matter of some difficulty and the exercise of considerable care to thoroughly eradicate every trace of the mucous membrane from the naso-frontal duct; search should be made in this region for an orbital recess running upwards, outwards and backwards over the roof of the orbit; such recesses are apt to be overlooked by the beginner. If undetected the operation will almost certainly fail to give complete relief. Another region to which especial care must be given is the nasal side of the naso-frontal duct. Very frequently an offshoot will pass up in this region towards the median line which may readily escape attention unless searched for. About half way down the naso-frontal duct elevations are frequently seen and if these be investigated, it will be found that the bone is very thin and when punctured exposes ethmoid cells which are very frequently diseased. These cells should be freely opened and the mucous membrane removed as thoroughly as that of any other portion of the frontal sinus. As a result of the thorough opening of the ethmoidal cells in this region, it is not uncommon to convert a narrow naso-frontal canal not over an eighth of an inch in diameter, into a wide space more than one-half inch in diameter. During this latter stage of the operation some blood necessarily passes from the nose into the naso-pharynx, but it has never been of such quantity as to cause any alarm on the part of the anesthetist or operator. We frequently pass a probe, threaded with gauze, from the frontal sinus through the nose out of the anterior naris and see-saw gauze through, so as to break down more thoroughly any small cells in the immediate neighborhood of the outlet of the naso-frontal duct. The entire cavity is now wiped dry from blood, carefully inspected to see if any spicule of rough bone exists which, if present, is smoothed off. The cavity is next packed with five per cent iodoform gauze one-half inch wide and double selvedge

edged. The gauze is packed into the bottom of the naso-frontal duct but not allowed to protrude into the nasal cavity and from there upwards until the space is entirely lightly filled. Two or three sutures are placed in the outer angle of the wound and the gauze left widely separating the inner margins of the wound so that on its removal all parts of the cavity may be readily inspected. The forehead is cleansed of blood and the towel removed from the forehead and an aseptic pad placed over the wound, held in position by a bandage.

AFTER TREATMENT.

The patient is returned to his bed, and in only a few instances has it been necessary to give morphin or other stimulant for the relief of pain or shock. In from 18 to 24 hours, usually on the morning of the day following the operation, the bandage and blood stained pad are removed. The surface of the wound is gently washed with a solution of bichlorid of mercury 1-5000. A fresh aseptic pad is placed over the wound and held in place by an adhesive strap. This I have found to afford sufficient protection from the entrance of outside germs and is far more comfortable than the bandage about the forehead. There is always some edema of the upper eyelid, and on the second day the edema is usually increased and the eye may be closed; boric acid solution may be used for bathing the outer surface of the eye. Should the aseptic pad be bloodstained, it is renewed one or more times before the 6th, 7th or 8th day, at which time the packing is removed from the frontal sinus. Some bleeding, mostly from the margins of the wound, occurs at this time; the cavity of the frontal sinus is gently wiped dry with sterile cotton, and iodoform gauze repacked into the cavity, again keeping the margins of the wound separated. Hereafter at intervals, varying from three to five days, according to the amount of secretion, the packing in the frontal sinus is changed. At the end of two weeks granulations have usually sprung up throughout the entire bony surface of the frontal sinus. At the end of three weeks the granulations in the margins of the skin wound are often excessive and are best trimmed off with scissors. About this time we may observe that the granulations have completely filled the naso-frontal duct. The surgeon has then to do with an open cavity lined with granulations and shut off from the nose below; the same as occurs in a mastoid wound fol-

lowing the closure of the opening into the tympanic cavity. Occasionally the granulations are weak and need stimulating with balsam of Peru, nitrate of silver or other similar substance. Packings are usually continued until the cavity has become small in size, when it is my usual custom to discontinue them and expect the opposing granulating surfaces to come together and unite. Occasionally a superficial pocket is formed with the evacuation for a few days of a small amount of secretion. If this happens, I enlarge the opening and curette lightly the interior of the cavity, repack for a short time, until again the granulations appear to be such as to be able to unite and obliterate the cavity. In a few cases we have found that the bone has remained bare in spots for more than three weeks. In these cases we usually find that the use of 5 per cent iodoform wool induces granulations over the bare bone better than the iodoform gauze.

In one patient the dura was accidentally exposed from too vigorous curettage of the posterior wall near the median line. A pledget of gauze was placed over the opening and the rest of the cavity packed as usual. No outward symptoms developed, contrary to what I had been led to expect from the experience of some of our German confreres.

In three cases the opposite or healthy sinus was opened, twice on account of a very oblique septum and once as a result of too vigorous use of curette on the septum. In all these cases a separate piece of gauze was placed over the opening, before packing the diseased sinus and in none of them was the healthy sinus infected. A good skiagraph would have shown the septum and prevented the opening of a healthy sinus in two of the three cases.

PERIOD OF HEALING.

Of the 113 frontal sinuses, six healed in four weeks, 19 in five weeks, 41 in six weeks, 21 in seven weeks, 7 in eight weeks, five in nine weeks, six in ten weeks, two in 11 weeks, and two in twelve weeks. One remained a persistent fistula for nine months, and a second operation was required. In one the fistula persisted for 11 months, but finally healed without any operation. In one the fistula persisted for 14 months, was operated on a second time, and one patient, two and a half years after the operation, still has a fistula.

The average time of healing, therefore, neglecting the four

last mentioned, was six and one-half weeks, including them it was 8.7 weeks.

The duration of the treatment is a matter which cannot be accurately foretold from the size of the sinus. Other things being equal, the smaller the sinus, the quicker one would expect it to heal. This has not always been the case. Some of the small sinuses have been nine and ten weeks in healing, while one of the largest sinuses healed in seven weeks. My impression is that in patients suffering from asthma, bronchitis, and multiple polypi formation in the nose, the sinus heals considerably more slowly than is the case in many other patients.

DEFORMITY.

Deformity by the "open method" of operation varies considerably from one that is scarcely noticeable in a person with a small frontal sinus and heavy eyebrow, to one that may be considerable, where the sinus is very large, and especially, if it is deep. In the earlier operations that I performed, the entire anterior wall was not removed. A small ledge was allowed to project over the sinus. The deformity consequent upon this method is, I believe, greater on account of the puckering at the site of the drainage, than when the entire anterior wall is removed, and the bone of the circumference of the frontal sinus bevelled from above downwards.

We have heretofore been afraid to inject paraffin, in order to overcome the deformity, fearing that the paraffin might cause a necrosis in the newly-formed connective tissue supposed to fill the sinus. As the result of the two secondary operations, we found that there was no connective tissue in the sinus; a deposit of bone had occurred, completely replacing the connective tissue. I shall attempt to correct the deformity by the paraffin injection method on some of my cases. It seems advisable to wait until the skin over the frontal sinus becomes freely movable, as it does in the course of six or eight months, after the healing has occurred.

RESULTS OF THE "OPEN" OPERATION.

From May 16th, 1901, until January 1st, 1905, I had performed this operation on 104 patients. Ninety-five had a single sinus involved, the right 52 times, the left, 43 times. Nine patients had a double frontal sinusitis. Thus, there were

in all, 113 frontal sinuses operated upon. Of the 52 right frontal sinuses, 32 were in males, and 20 in females; of the 43 left frontal sinuses, 27 were in males and 15 in females. Of the nine double operations, two were in males, and seven in females. Of the 104 patients, 101 had their frontal sinuses obliterated, as a result of a single operation. One patient, Mrs. A. B., age 65, double frontal sinusitis, operated upon two and a half years ago, still has a fistula, with very little secretion, a drop a week. Two patients have each been operated upon twice.

One patient, Mrs. J. H. S., double frontal sinusitis, right side healed, left side continued to secrete for nine months, after which time I opened the sinus again, and found an area of polypoid tissue around the upper portion of the naso-frontal duct, where I had probably failed to remove all of the mucous membrane. As the result of the second operation, the patient had a complete recovery.

The third patient, Mr. P. T. B., age 36, right frontal sinus apparently healed, when three weeks later a fistula formed on the forehead and discharged muco-pus. Light curettage was followed by apparent healing. The breaking down and healing recurred every three or four weeks, until fourteen months after the original operation, the cavity was again explored, and some portion of the mucous membrane found at the upper inner angle of the frontal, and also in the naso-frontal duct. This case is apparently healed now. In all three of these patients, it was possible to pass a probe from the nose, through the naso-frontal duct, into the sinus, to the same distance that it was possible before the operation. The obliteration, therefore, of the naso-frontal duct had not been accomplished in them.

Two patients have died since their frontal sinuses healed. One, Mrs. I. D., age 27, first seen February 9, 1904, had multiple polypi in both nares for five years, severe asthma, chronic bronchitis and emphysema, great frontal headache. Polypi removed intranasally and naso-frontal duct dilated, frontals irrigated, no relief. March 21st, chloroform anesthesia by a professional anesthetist on account of pulmonary lesion. Both frontals operated on radically by open method. Considerable cyanosis during operation, very blue during last half hour. Right frontal sinus, operation lasted 25 minutes; left frontal, 50 minutes. Patient rallied well and left hospital for home 35 miles away 48 hours after operation.

April 30, right sinus healed. May 7, left sinus healed.

May 12, operation on antra, chloroform anesthesia by same anesthetist. Anesthesia began at 2:05 p. m., and completed at 3:45 p. m. Same cyanosis as at first operation. At 3:55 patient was in room and partly conscious. I saw her at 4:10, at which time she was conscious, pulse 130, respirations somewhat labored, pupils normal. Patient left in charge of anesthetist. I had no sooner left than pulse became very feeble. Stimulating enema ordered, but before nurse could give it patient died at 4:15 apparently from effects of chloroform. As the antra alone were operated upon, there could have been no possible cranial lesion produced during the operation.

The other case, Mr. E. C. E., age 39. Frontal headache, very severe at times, with edema and redness of left upper lid, profuse discharge from L. N. Three years standing following grip. Intranasal treatment for six months without much relief. Operation October 31, 1904. Very large L. frontal, with orbital recess, ethmoids and antrum. Left hospital November 9th and came to office for treatment. November 28, had attack of pleurisy with effusion, confining him to his house in Brooklyn. On December 12 patient resumed visits to office. Very little progress in healing. Healing continued slow until February 2, when frontal wound closed—antrum not yet filled up. No nasal discharge. The latter part of February, 1905, patient contracted a lobar pneumonia and died on March 6, 1905. No autopsy.

Seven healed cases have reported at various times, with involvement of some of their accessory sinuses. The frontal sinus has always been carefully investigated, but so far as I could determine it was not involved.

1. Miss A. C., age 29. Left frontal and antrum operation January 22, 1902. Had post-nasal discharge in September, 1902, again in February, 1903, and in June, 1904. Left sphenoid acutely inflamed. Cavity irrigated, discharge ceasing in two weeks. Was seen in the interval and nose clean.

2. Mr. P. J. W., age 34. Right frontal and antrum operation March 14, 1903. Still has fistulous opening beneath cheek. No nasal discharge.

3. Mrs. J. F. B., age 37. Multiple polypi; pansinusitis, five years' standing. Left frontal, antrum and ethmoids operated on January 21, 1904. Right frontal, ethmoids and antrum on March 23, 1904. In the latter operation no trace of frontal

sinuses could be found. Left antrum and sphenoid discharge occasionally. R. sphenoid has polypi formation about ostium, these were removed in October, 1904, and again in May, 1905.

4. Mr. P. R., age 57. Sphilitic history. Double frontal sinusitis with pus in both maxillary sinuses. Only frontals operated on. Pus disappeared from R. antrum after frontal operation. In February, 1905, had hard cold and both antra discharged very foul—smelling pus for one month. Cured by irrigation. Left sphenoid, although anterior wall had been removed so that ostium was nearly one-half inch in diameter, also secreted pus. Mucous membrane very thick and red. Now dry.

5. Dr. A. F., age 35. Left frontal antrum and sphenoid. Operation on left frontal and antrum November 1, 1904. Frontal healed. Antrum, small fistula still leading into mouth. Had acute rhinitis in April, 1905. Left sphenoid discharged for two weeks and right antrum also involved and had to be irrigated three times.

6. I. R., age 34. Left frontal ethmoid and antrum, operation on left frontal and antrum November 19, 1904. Very small fistula still in antrum. Had severe acute rhinitis April 15, developed severe acute right suppurative otitis media, paracentesis and discharge for six weeks.

7. C. S., age 23. Double frontal sinusitis with discharge from sphenoid and polypi in choanae, seen from naso-pharynx. Operation on frontals December 19th, 1904. Ostia sphenoidali enlarged with forceps, polypi excised. March 29th, more polypi found around ostia and again removed.

To Recapitulate.—Of the 104 patients two are dead, one from chloroform narcosis, the other from pneumonia, one case has a fistula two and one-half years after the operation. Two required a second operation before obliteration of the sinus was accomplished. Thus 3 per cent of secondary operations were necessary to healing. Seven cases are still under occasional treatment, not for frontal sinusitis, however. Three of these cases were operated on so recently that there has not been time to correct the disease in the other sinuses.

THE INTRANASAL ROUTE IN OPERATING UPON
THE NASAL ACCESSORY SINUSES.*

BY WALTER A. WELLS, M. D.

WASHINGTON.

That the nasal passages can be utilized as a pathway to the attack of the diseased nasal accessory sinuses, depends upon the well known anatomic fact that all of these sinuses communicate with the nasal fossae by one or more openings or ostia, which though variable as they certainly are as regards their size, form, position and number, are constant as regards their presence, and further by the fact that all of the sinuses, with the exception of the frontal, are in relation to the cavity of the nose proper over an area of greater or less extent, which represents the common boundary wall between them.

Any method of treatment which aims to gain access to the sinuses, either through one of its natural openings, enlarging it if necessary, or the formation of an artificial opening, or by a still more extensive surgical destruction of an intermediary wall, may rightly, I think, be denominated the nasal, intranasal, endonasal or transnasal route.

Having been honored by the president of our Society with the agreeable commission of presenting the claims which can be urged in favor of the intranasal route for attacking the diseased nasal accessory sinuses, the author trusts that his advocacy of the cause will not be taken to mean that he practises the nasal route exclusively and considers it all sufficient for every kind of case.

On the contrary, he recognizes clearly enough that it has its objections and limitations, and must often be superseded by the so-called external operation.

The nasal route can, I think, properly be designated the conservative method, inasmuch as it aims to accomplish a cure with the least possible destruction of healthy tissue, and without producing any deformity, and as a rule without having resort to a general anesthetic.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

A mistake, however, would certainly be committed if the conclusion were reached that because conservative it requires less skill or anatomic knowledge inferior to that necessary for performing the more radical operation; for that is not the case. As we are operating in a more confined space than in the external operation where the operative field is generally enlarged, we shall have consequently greater necessity for depending upon the surgeon's *tactus cruditus*; and for the same reason, a thorough knowledge of the normal anatomy of the parts, and possible abnormalities to be met with is absolutely indispensable.

Recently there has been such activity in devising and experimenting upon new methods of attacking these sinuses from without, and so much attention has been centered upon methods of opening up one sinus to gain access to another, and upon those ultra-radical operations which seek the complete obliteration of the cavity at the cost of the wholesale suppression of the sinusal walls, that we are, it may be reasonably suspected, in a fair way to lose sight of the fact that there is such a thing as a nasal route.

Before we advise a patient to submit to an operation under a general anesthetic, with its possible accidents or to one that entails a risk of orbital complications, such as strabismus, or that will leave an ugly facial deformity, should we not consider calmly, carefully and conscientiously what can be accomplished by a more conservative course?

The objections which I have at one time or another seen or heard raised against employing the nasal route in the treatment of the accessory sinuses, may be summarized as follows:

1. That it is not always practicable.
2. That valuable time is lost postponing radical measures.
3. That the nasal methods are generally slow and tedious.
4. That they are uncertain as to results.

To answer these objections *seriatim*, we will say in regard to the first, that the nasal route is not always practicable—that if there are certain cases in which the treatment is not practicable, there are others where it is, and that the latter will be found to increase, and the former diminish in proportion to our efforts to put this method into effect.

2. The second objection, viz.: that valuable time is lost in postponing radical measures, is the one most commonly urged

against conservative nasal treatment. Supposing the nasal treatment to have failed in making a definite cure, is the time actually lost in employing any method which consists in the frequent removal of purulent secretions and thus succeeds in relieving the patient at least of the most disagreeable symptoms? Moreover, even though the case must come ultimately to a more radical operation in order to effect a perfect cure, the nasal treatment has in all probability accomplished something which contributes toward a successful outcome, such as the removal of polypi and hypertrophies, and the establishment of better nasal drainage.

In the case of intranasal treatment of maxillary sinusitis, if done in the manner which I shall later describe, we will have actually performed one of the stages of the radical Caldwell-Lue operation, which will prove a decided advantage, should this operation become eventually necessary.

3. The third objection, that the nasal operations are slow and tedious, has to be admitted as generally true, though not always. The only question here is whether the relief afforded or the chance of cure outweighs all the disadvantages of the external route.

4. This brings us finally to the vital question of the efficacy of the nasal route, a question that is involved is the fourth and last objection, viz., that the nasal route is uncertain. Being uncertain, it is argued, it were best to proceed at once to measures that can be better depended upon for successful results.

That a great many cases do get well under conservative treatment will be generally admitted. These cases, moreover, are often such that, according to all rules, seemed to demand radical measures.

Many specialists have borne testimony to the fact that cases in which they expected to operate, have surprised them by recovering under simple treatment, undertaken tentatively, or because the patient himself held out against more radical measures. The uncertainty in the results, then, instead of being an objection, is an argument in its favor, because we ought to give the patient the benefit of the doubt, before proceeding at once to a radical operation, which the outcome may prove unnecessary.

Some will say, differentiate your cases. The nasal routes will do very well for your mild, simple, acute cases; but when

it comes to a chronic case, in which extensive changes have been wrought in the lining membrane and bony wall of the cavity, your conservative measures are useless, and you must proceed at once to radical methods. These are good principles certainly; but how to apply them, there is the difficulty.

The chronicity of an existing sinusitis can be judged only from the history of the case, and is therefore unreliable. The patient may mislead you into mistaking for a recent case, what is in reality a recrudescence of a long standing, latent inflammation of the sinus, or *vice versa* into taking to be chronic, what is in fact recent, because the patient confuses the present symptoms with the symptoms of ordinary acute rhinitis which he has had in the past.

The state of the interior of the cavity as a guide to a choice of operative method is of course practically unavailable, unless in the case of the maxillary antrum, where some attempt has been made to distinguish between, on the one hand, an acute sinusitis or simple empyema without thickening in the lining membrane, and on the other a true sinusitis, in which the capacity of the cavity has been contracted by hypertrophic and polypoid degeneration in the lining membrane.

We have for this purpose the following three signs:

1. *Mahu's sign*.—Mahu punctures the antrum, injects into it a fluid, then withdraws and measures it. If the capacity proves to be greater than 2 cm. he concludes that we have to deal not with a true sinusitis, but with a simple empyema.

2. *Lubet-Barbon's sign*.—According to Lubet-Barbon, a true sinusitis may be inferred, if after a thorough washing out of the sinus, drops of pus will continue to flow through the canula, allowed to remain a few minutes in place.

3. *Guisez's sign*.—The easiest to apply, and the most reasonable is the sign of Guisez. It depends upon the principle that polypoid thickening in the mucous membrane, no less than the presence of pus, may account for a failure to get illumination in a diseased antrum. If then an obscurity that was present before, disappears after emptying the sinus of pus, he infers that we have to deal only with an empyema, and not a true chronic sinusitis.

If after applying one or more of these tests we can establish with a reasonable certainty, that the case before us is a true sinusitis, and that chronic polypoid changes have already taken place in the interior of the cavity, an immediate radical opera-

tion is indicated. In all other cases, the nasal route should be given a trial, and if it fails no harm at least has been done.

The nasal route recommends itself as the natural one. An outlet is secured for the diseased secretions through a channel, which constitutes the natural outlet for secretions under normal conditions, and for this reason it is far more convenient and agreeable to the patient than any other.

After all, whether we approve of the nasal route or not, the circumstance that our patients will sometimes refuse to undergo a radical operation from one consideration or another, make it imperative for us to practice it, and therefore I beg your indulgence while I as briefly as possible, outline the nasal route for the individual sinuses.

THE MAXILLARY SINUS.

In a large proportion of cases antrum disease is undoubtedly of dental origin, but in such cases attention must be primarily directed to the diseased tooth or teeth and then the alveolar route naturally takes precedence over all others.

We are considering here, however, that other group of cases, not dependent upon the condition of the teeth, but whose inflammation analogous to those of the other sinuses are of nasal origin.

The nasal route to the antrum of Highmore includes :

1. Irrigation through the natural opening (ostium maxillare or ostium accessorium.)

2. Irrigation through an artificial puncture with trocar in either middle or inferior meatus.

3. Large opening in outer wall of nose.

1. Irrigation through the natural opening, although recommended and practiced in the past by such eminent men as Lichtwitz, Garel, Hartman, Stoerk and Weil, has, I think, too many disadvantages and too few advantages to deserve to be considered as a method of treatment. The opening being near the roof, it is not practicable to effect a thorough cleaning of the cavity. Thick, grumous matter which has sunk to the bottom will not be stirred up and the cleansing will be only superficial.

If there be no accessory opening, the pus will have no place to make its exit, except around the sides of the canula, which obviously may prove quite insufficient.

2. *Artificial opening with trocar.*—Some authors have practised puncturing through the middle meatus, for the reason that

here the outer wall of the nose is thin and membranous, and the trocar can be made to enter with less force.

But besides having the same disadvantage as the natural opening, viz., its high position, an additional objection exists in the danger of puncturing the orbit in this locality. The outer wall of the nose in the region of the middle meatus sometimes is so fused with the inner orbital wall that a needle entering here is quite certain to enter the orbit. The puncture should, therefore, be made in the inferior meatus, thus avoiding these inconveniences.

Mickulicz was the author of the method of treating the antrum by means of a puncture in the inferior meatus. Krause was also a strong advocate of this method and invented a trocar for the purpose.

The point of the needle should be inserted a little behind the middle of the anterior posterior distance of the nose, and well up under the attachment of the inferior turbinate if we desire to select that part of the inferior meatus where the wall is thinnest.

Curtis (Trans. 9th An. Meeting Amer. Laryng. Rhin. and Otol. Soc., Lexington, Ky., 1903) says the puncture should be 1 cm. behind anterior attachment of inferior turbinate. This is too far forward. It should be from two to two and one-half cm. back of this point, in order to avoid the accidents which will be referred to later.

It is generally stated that treating the antrum through a small puncture with a trocar is unsatisfactory, because of the tendency of the opening to soon close. My experience has been otherwise. Before I had constructed the instrument which I will describe later, I treated quite a number of cases of suppurative inflammation of the antrum, using the Myles trocar or canula. To facilitate the introduction of the canula into the opening at subsequent sittings, I improvised a blunt, pointed, obturator to take the place of the sharp, pointed trocar, and I very seldom experienced any difficulty in finding the artificial aperture and utilizing it for the purpose of irrigation.

I recall one case in which this must have been done not less than 150 times.

The case is instructive in that it demonstrates what may sometimes be accomplished by persistence in the conservative course of treatment.

The patient, a young lady, first came under my care in

August, 1902, suffering from a left frontal sinusitis. After several months irrigation, the liquid injected into the frontal sinus returned clear; but finding nevertheless pus in the middle meatus, I suspected antrum disease, and punctured.

After having irrigated the antrum through the artificial opening in the inferior meatus on an average of three times a week, and the pus still continuing to come, I proposed radical operation, but the patient preferred the symptomatic relief to the promised cure and refused. There was nothing to do but continue the irrigation, which was done sometimes twice a week, sometimes oftener, for full twelve months from the time the antrum was originally punctured. At last, to my surprise, the pus ceased to appear in fluid returned from the cavity, and a perfect recovery resulted.

It is now a year since; the patient has contracted some colds in the meantime, but there has been no return of the pus.

We may use either a straight or a curved needle for puncturing the antrum. It is not possible with a straight needle, to get the shank as near a right angle to the wall of the nose as is desirable, and there is consequently greater danger of the point sliding back and failing to enter. If a curved instrument is used, the point ought to be applied a little further back than when the straight is used, on account of the greater danger of entering the opposite wall of the antrum.

If the trocar has entered the sinus, we become aware of it by the following signs:

(a) The operator experiences through the sense of touch a crepitation from the breaking through of the thin bony wall, and a feeling of having suddenly overcome an obstruction and plunged into a cavity.

(b) The patient's sensation can also be relied upon of the instrument being in the cavity; especially if he has a pain directly over the root of the teeth.

(c) The instrument becomes fixed, the shank being pressed firmly against the anterior edge of the septum.

(d) If pus be present, some drops may flow through the canula.

(e) The conclusive evidence is the appearance of pus when the cavity is irrigated.

Difficulty may be experienced because of unusually thick walls, or the presence of pus or deviations in the septum, or of a low reaching turbinate; but they are such as may be

overcome. A division of the sinus into two cavities may be misleading. Where suspected, a second puncture should be made farther back or forward as the case may be. A fusion of the outer wall of the nose with the orbital plate is an anatomic anomaly which may lead to unpleasant consequences. This as a rule is a serious consideration only when the puncture is in the middle meatus. But exceptionally it may be so marked as to cause an accident, even from a puncture in the inferior meatus. Dr. Beamon Douglas reported a case, evidently of this class, in which the puncture was followed by a swelling in the orbital region, the eyes becoming closed from the edematous condition in the lids.¹

The facial plate may also become fused with the outer wall of the nose, in which case the antrum is very much narrowed in its anterior part, and there is danger of the needle going all the way through, and piercing the cheek. Puncturing well back as advised will circumvent this accident.

We should always study the conformation of the face before making these punctures, especially with reference to a bulging outward of the outer wall of the nose, or a flattening in the malar region, and we may gain information that will save us from accidents of this kind.

3. *Large opening into the outer wall of the nose.*—Although this is practised regularly as a part of the Caldwell-Luc operation it is seldom that it is done as an independent procedure.

Rethi (1896), Bayer, (1899), Kaspariantz (1900), and quite recently Onodi have advised treating maxillary empyema by means of a large opening in the middle meatus, the naso-antral wall being thinner at this part of the nose.

Claoue of Bordeaux in 1902 (*Semaine Medicale*, October 15, 1902) advised making a large opening in the inferior meatus, instead of the middle. He used originally a drill driven by an electro-motor for the purpose, but later gave this up because of the painfulness of the proceeding, and adopted a hand-drill and special forceps to make the opening. Curtis at the eighth meeting of this society in 1903, spoke favorably of a large opening through the outer wall of the inferior meatus, which he made by means of burr drill driven by an electric motor. Escat (*Toulouse Medicale*, April 15, 1904) uses a sort of rectangular trocar to enter the antrum, and enlarges

1. B. Douglas—Accident with an antrum trocar. N. Y. Med. Jour., 1904, LXXX, 1077.

the opening by means of special hooks. The flaps thus cut in the outer wall, are then removed by means of a snare or cutting forceps. Escat has reported cases of 1, 2, 3, and even 5 years' duration cured by large openings through the inferior meatus.

Gavello of Turin (*Sulla cura chirurgica delle sinusite mascellare cronici, Gior. d. r. Acad. di Torino*, 1904 4s. X 322) in a recent article also advocated the large opening and has devised an instrument for making it.

There is no illustration of this instrument accompanying the article, but it is described as a trocar on the principle of Naegele's craniotome. After puncturing with this, he enlarges the opening by means of common bone forceps.

The operation of making a large opening through the inferior meatus seems certainly to be a very rational one. We thus establish a communication with the nose at the lower part of the cavity, provide good drainage, and permit the diseased sinus to be aerated and irrigated *ad libitum*; and the secretions being evacuated by way of the nose give far less discomfort to the patient than were the case should the opening be in the alveolar process or canine fossa. Furthermore, as already once stated, if ultimately the Caldwell-Luc operation must be performed, one stage of the operation will already have been accomplished.

It occurred to me that there was a need of some simple method of making this large opening. For this purpose, I have constructed the instrument which I show you. (Fig. 3.)

In the first place, it consists of a trocar and canula, having a curve representing the arc of a circle as in Myles' instrument, but of considerably greater calibre. I have added a blunt obturator, but have discarded the little connecting piece which Myles fits into the canula in irrigating.

The chief feature of the instrument is the small plate on the concave side of the canula, containing a rasp, intended to cut away the edge of the opening and thus enlarge it to the diameter desired.

Before making the large opening into the outer wall, any polyps which may happen to be present should be thoroughly removed, and the inferior turbinate cut away sufficiently to give good access to the naso-antral wall in this locality. With a pair of serrated scissors, the turbinate is cut away close to its attachment to the wall for about one-half or two-thirds



Fig. 1. Author's Sphenoid Sinus Probe and Canula.

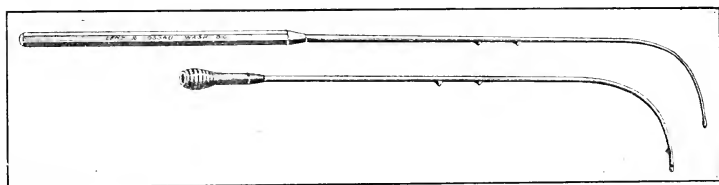


Fig. 2. Author's Frontal Sinus Probe and Canula.

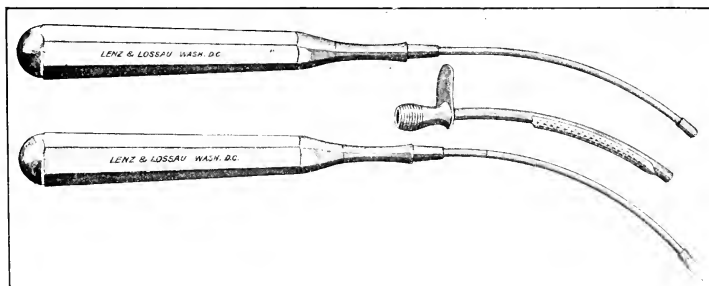


Fig. 3. Author's Special Trocar and Canula for Making Large Opening Into Antrum Through Naso-Antral Wall.

of its extent, after which with wire snare this much of the turbinate can be very easily severed and removed. After having thoroughly satisfied ourselves of the presence of pus in the antrum, we can proceed to make the large opening by means of the special trocar described. The point of the trocar is inserted well back about the junction of middle and posterior third of the inferior meatus; and in case a local anesthetic is used, well up under the attachment of the inferior turbinate where the antro-nasal wall will be found thinner. If done under general anesthesia, the opening might as well be made near the floor of the nose, thus obtaining the most desirable point possible for drainage. As soon as the instrument is felt to have entered the cavity, the blunt obturator is substituted for the trocar, and the rasp made to enlarge the opening in a generally forward direction to the extent of a couple of centimeters or more.

The accompanying photograph shows the size, form and location of the opening, which may be made with this instrument.

THE ETHMOID CELLS.

There seems to me rather more definite indications to guide the operator in the case of the ethmoid than of the other sinuses. Most authors are agreed as to the advisability of attempting a cure by operations through the nose when there is but a mild state of inflammation present, or when the disease is circumscribed and limited to but a few cells. Where orbital symptoms are present, and the patient presents himself with an abscess or fistula in the region of the os planum, the external operation will generally be necessary. In all cases some preliminary intranasal operation at least will generally be necessary, for before attempting immediate external operation, the natural course is first to remove polyps and polypoid hypertrophies, and thoroughly cleanse the nose of purulent secretions and establish good drainage.

If it is decided to push the intra-nasal treatment any farther, the next step is to remove the middle turbinate. When this is done, polyps previously concealed and hardly suspected to be present, will frequently come into view and give us more employment for the wire snare. The intranasal operation must proceed by slow successive stages, because of the bleeding which generally obscures the field and interferes with a good view of the parts.

Many different instruments have been devised for breaking down the ethmoid cells.

Hajek uses a trocar and hook. Grünwald and Myles have devised forceps and Bryan a curette for the purpose. The Luc cutting forceps have seemed to be the ideal instruments. They are very effective in biting off portions of the labyrinth seized by the blades, and the shanks being slender, they obstruct the view as little as possible.

The use of the electric cautery is to be condemned because of the reaction with which it is followed; and punching instruments, trocars, drills and electric trephines ought to be avoided because of the danger of their being unexpectedly thrust either upward through the cribriform plate or outwardly through the lamina papyracea. With whatever instrument one may be working extreme caution is required.

There is considerable variation in the volume of the ethmoid labyrinth, and the endeavor to effect a complete removal of the cells is attended with the danger of penetrating one or the other of the two structures mentioned.

Using monocular vision, an imperfect idea of distance is very easily obtained, and the operator should frequently remove his instrument and make a mental estimate of the distance within the nose reached by the end of the instrument when in place.

I think it is worth while to recall the fact that the cribriform plate is fully one cm. below a line that is on a tangent with the upper border of the superciliary ridges and that one in operating should always keep below a horizontal plane at the level of the internal angular process or inner canthus of the eye.

It is often a question to determine what tissues are so diseased as to require removal, and what may be left. The probe may be of service as a guide to exposed bone or to such as is friable, and easily broken down. Membrane that is deeply colored, puffy, swollen and edematous, should generally be removed. In case of doubt, it is the part of wisdom to be conservative and let the progress of the case dictate as to further intervention.

The advantages of the nasal route when feasible, are that it opens the cells at their most dependent situation, it is attended with a minimum of surgical intervention, and that it avoids disfiguring external scars.

THE FRONTAL SINUS.

The external operation upon the frontal sinus, especially those which aim at a complete obliteration of the sinus are sometimes attended with such a hideous deformity, that whatever may be our own inclinations with respect to its indications in a given case as compared with conservative intranasal treatment, the patient will frequently decide the matter by refusing to consent to its performance, thus compelling us to adopt the only alternative.

When we consider that at any rate the radical cure of frontal sinusitis is far from having attained the position of an accepted finality, we are the more disposed to yield to the patient's own wishes and give the conservative treatment at least a trial.

Hajek in the recent edition of his unexcelled treatise on the accessory sinuses (*Pathologie und Therapie der entzündlichen Erkrankungen der Nebenhöhlen*, Leipzig and Wien, 1903, page 177) shows unusual respect to the endonasal method of treatment and gives expression to such favorable views of its usefulness, that they deserve to be noticed.

He lays special stress upon resection of the anterior end of the middle turbinate and removal of polyps, etc., from the neighborhood of the nasal end of the ductus naso-frontalis, which not only in acute cases he says, or acute attacks in the course of a chronic empyema, but in the chronic cases themselves constitute a therapeutic expedient of the very highest value, so long as deep-seated muco-periosteal degeneration or destruction in the bony walls of the cavity has not already taken place.

He recognizes that his views are in direct opposition to the prevailing sentiment among contemporary rhinologists, but he argues their rationality and supports them from clinical experience.

Three methods have been used of approaching the frontal sinus by way of the nose:

1. Simple irrigation through the natural opening.
2. Drilling through the anterior-superior wall.
3. Enlarging the naso-frontal canal.

Irrigation of the sinus by way of the infundibulum is a perfectly practical procedure in a large proportion of cases.

Anatomic studies like those recently made by Mosher of

Boston, have been of great value in familiarizing us with the anomalies, as well as the normal relations of the structure in this vicinity. Some authors are inclined to discredit the practicability of probing the sinus through its natural opening. In a few cases the canal being unusually constricted or long and tortuous, it is impossible. In most cases, a resection of the anterior end of the middle turbinate will be required to give free access to the infundibulum; but in quite a number of patients this is rendered unnecessary by reason of the fact that the naso-frontal duct, instead of being continuous with the hiatus semilunaris opens by a wide orifice directly in front of its anterior upper extremity.

In regard to the technique of the procedure, permit me to quote from a previous article (*The Laryngoscope*, St. Louis, April 19):

"Using the uncinate process as a guide (resection of the anterior end of the middle turbinate having been previously done in some cases) to begin, we apply the beak of the probe well back in the hiatus and draw it upward and forward in the direction of the sinus at the same time that the handle is depressed. If it does not slip easily into the cavity, after tentative modification in the curve, do not use force, but holding the probe always lightly in the hand, reintroduce and feel for the ostium a little in front of the upper extremity of the hiatus."

Error most easily results from supposing that the probe has entered the sinus when it has entered an ethmoidal cell. As a rule, the openings to these cells are placed externally, and the point of the instrument is more certain to enter by being turned slightly toward the median plane.

The beak of the probe should have a curve of about 90 degrees at about three cm. with a slight additional curve a few millimeters from the extremity. The probe originally employed has been slightly modified. It is made a trifle more rigid than formerly, and having already the curve, recommended as being right for a majority of cases. It is flexible enough, however, to permit of whatever modification of this curve may be necessary for the individual case. I still hold to the straight shank, instead of one of a sigmoid curve advised by some authors, as it is only with the former a proper idea may be had of the angle of inclination of the shank, an important re-

quirement in an orientation with respect to the entrance into the sinus.

If the sound or canula be in place we will be aware of it by the following signs:

(a) It will have penetrated to a distance between six and seven cm. from the anterior nasal spine. (Six cm, when at the floor of the sinus and seven when fully into the cavity.)

(b) The direction of the shank should be such that it makes an angle of 30 to 35 degrees with the floor of the nose.

(c) The beak of the probe will be pointing directly forward, as shown by the indicators on the handle.

(d) The beak being free in the cavity, is capable of considerable excursion from side to side, as shown by the rotation of the handle upon its axis.

(e) Pus will flow along the shank of the instrument. In case of the canula, insufflation or irrigation will bring pus to light, a previous thorough cleansing of middle meatus being understood.

2. The operation of drilling through the roof of the nose to reach the frontal sinus as proposed by Schaffer, cannot be too strongly condemned. The difficulties of entering by this route and the danger of penetrating the cribriform plate must be apparent to any one who is in the least informed as regards the anatomic relations in this locality. Spiess recommended controlling the operation by means of the skiagraph, a procedure endorsed also by M. Schmidt. Even with this safeguard, the end gained is not worth the risk and trouble.

3. A more rational procedure is that recently described by Ingals, consisting in the enlargement of the naso-frontal duct by drills, especially devised for the purpose.

The region of the middle meatus being previously cocaineized, a flexible pilot is introduced into the infundibulum, over which is passed a hollow burr operated by a dental engine. The surrounding tissues are protected by means of a flexible shield. Ingals claims to be able with this instrument to successfully enlarge the canal to a diameter of six mm., after which he introduces a small sharp ring knife and cures the mucous membrane about the ostium frontale. The canal is packed with gauze, which is allowed to remain in place four or five days. Chlorid of ethyl anesthesia was employed in performing this operation.

It is unnecessary to state that all intra-nasal methods in-

clude a thorough removal of polyps and polypoid hypertrophies, and of spurs or other pathologic conditions which obstruct the naso-frontal canal and interfere with drainage.

THE SPHENOID SINUS.

It is only a few years ago that the first efforts were made to gain access to the interior of the sphenoid.

The subject was early taken up in this country and we are particularly indebted to Myles, Bryan, Wright and more recently to Coakley, Henkel, Curtis and Berens for valuable contributions demonstrating the possibility of rational surgical treatment of its diseases.

Various methods have been devised of attacking the sphenoid, so that we have the fronto-ethmoidal, the orbito-ethmoidal, the maxillary, the intra-nasal and the naso-pharyngeal route, and the various operations of Rouge, Oelier, Verneuil and Chalot, Baudenhauer and Garel, Moure, Furet and Jansen.

Without going into detail as to various other methods, we may say that the intra-nasal route commends itself as being the most direct, and most conservative method and as being the route which has been already utilized to diagnose the condition and will probably be utilized in completing the cure and because it avoids deforming cicatrices and the exposure of other healthy sinuses to possible infection.

The intranasal method consists in irrigating the sinus through its normal opening, or by breaking down over a greater or less extent the anterior wall and curetting the interior of the sinus. The natural opening is situated on the anterior wall near the roof and somewhat outward, so that it is seldom visible by anterior rhinoscopy.

It is oval in shape, with its largest diameter vertical and measuring three to five mm. but somewhat narrowed by folds of mucous membrane.

The distance of the antrum from the anterior nasal spine has been variously estimated from five cm. to nine cm., which represent respectively too low and too high estimates to serve as an average.

My observations agree with those of Coakley, who puts the distance at about seven cm.

On the probe and canula which I use for sounding and irrigating the sinus, I have put two small indicators, one at seven, the other at eight and one-half cm. from the point, the

former to mark the distance from the anterior nasal spine to the situation of the ostium, and the latter to mark the distance upon the handle when the probe has successfully entered the sinus. The probe should be slightly curved near the end, in order to reach the ostium which, as stated, is placed a little laterally. This curve can be made to serve a purpose, as I have discovered, in ascertaining whether or not the probe has successfully entered the cavity.

For if guided by the indicators on the handle, we first turn the point upward, it comes in contact with the roof, when it has entered the sinus but a slight distance and cannot be pushed farther; if now the point be turned downward, it becomes free, and the probe can be generally entered an additional cm. or more, until the point comes in contact with the posterior wall. (Fig. 1.)

To sound the sphenoidal sinus through its natural opening, introduce the probe, with the convexity of its curve above, obliquely upward across the juncture of the middle and posterior thirds of the middle turbinate, until its point meets with an obstacle which will be the anterior wall of the sphenoidal sinus. Now turn the point laterally and immediately or with a little groping the probe will glide through the ostium into the sinus.

In a majority of cases, it is necessary to resect the greater part of the middle turbinate. In cases of naturally small, flat turbinate, or where atrophic conditions exist, this expedient is rendered unnecessary. A deflected septum or large spur may sometimes also have to be overcome as a preliminary to a successful introduction of the probe.

One may know that the sinus has been entered by the following signs:

(a) The end of the probe will be distant from the anterior nasal spine from seven to eight and one-half cm.—in cases of extra large sinus, up even to nine and ten cm.

(b) The instrument becomes fixed; that is, excursion in all transverse directions, is rendered impossible; but it may be drawn back and forward and rotated to a certain extent upon its own axis, especially when the point is downward.

(c) The probe can be advanced from one to two cm. more, when the point is directed downward, then when upward.

(d) Post-rhinoscopic examination will show the probe properly directed for the ostium, and at least that it is not in the naso-pharynx.

(e) Pus may flow along the handle of the probe; or if it be the canula inserted, the flow of pus from irrigation will give positive proof if its being within the sinus.

Extreme caution must be observed in irrigating the sphenoidal sinus, as strong and irritant solutions, or non-irritant solutions if introduced under pressure, are liable to set up alarming cerebral symptoms owing to the extreme attenuation of its upper wall, which may exist.

Boric acid or normal salt or a simple sterile solution may be injected under slight pressure, and having care that the canula does not so tightly fit the ostium as to prevent a reflux of the fluid, the patient inclines the head forward to enable the fluid to appear at the anterior parts.

The natural opening being near the roof, and there being no accessory opening as in the maxillary antrum, this method of treatment does not seem to give much promise of success. Nevertheless we have seen cases of acute sinuistis get well spontaneously, or under mere cleansing and depleting application in the post-nasal region, and it may be that a timely irrigation or so may occasionally be just sufficient to help to the *vis medicatrix naturae* to enable it to accomplish a cure, which alone it might have been unable to do.

As to the more radical measurement which look to the breaking down of some of the wall of the cavity, we need lose no time in the consideration of methods which aim to reach it by way of its floor.

The lower wall is too thick, and operations by this route are awkward, cumbersome and uncertain.

The anterior wall has the advantage of thinness and accessibility, and may be considered truly the surgical wall of the sinus.

Hajek attacks this wall by introducing his special hook through the ostium sphenoidale, breaking down its edges, which may then be removed with the forceps.

Moritz Schmidt employs a hand saw to take the place of the hook. St. Claire Thomson uses a long forceps which after being introduced through the ostium, are opened and thus enlarge the opening. Bryan, Coakley and others use a gouge or curette. Trocars, hand drills, electric motor drills or galvano-caustic electrodes, are in the writer's opinion unsafe instruments to use in this locality, because of the danger of unexpectedly penetrating the roof and entering the cranial cavity.

Whatever instrument be used, let the cutting be always downward and inward. Downward in order to keep away from the cranial cavity, and inward as we are thus less liable to have a troublesome hemorrhage from an injury of the sphenopalatine artery, which is located to the outer side of this wall.

Some operators (Henkel, St. Claire Thomson) prefer to have the patient under a general anesthetic, and be guided to the proper locality with one finger introduced into the nasopharynx, which is to be commended as a safe and rational procedure, especially in those cases where the view from the anterior nares is not particularly favorable.

Having made a sufficient opening into the anterior wall, a careful curettage may be necessary to remove granulation masses and fungosities from the interior; but it is best to avoid any curetting the roof which may at times be of the thinness of parchment, and easily penetrated, and to but very gently curette the sides because of the danger to the nerves and vessels which pass through the optic canal and sphenoidal fissure.

The interior of the sinus having been washed or swabbed with some antiseptic solution, may be loosely packed with gauze, which may be changed every day or so as the conditions require.

XXVII.

RESULTS OF OPERATIONS BY WAY OF THE MAXILLARY ROUTE FOR COMBINED DISEASE OF THE MAXILLARY ANTRUM, ETHMOID LABYRINTH AND SPHENOID SINUS.*

By T. PASSMORE BERENS, M. D.

NEW YORK.

At the request of your President, it is the privilege and the pleasure of the writer to describe again the operation for the radical cure of multiple sinusitis, via. the maxillary route, when affecting the maxillary antrum, the ethmoid labyrinth and the sphenoid sinus. Jansen, Boeninghausen and Mouret have described operations for the radical cure of empyema of the antrum of Highmore, which are more or less similar in their technique. The operation used by the writer applies to the three cavities, the antrum, the ethmoid and the sphenoid, and is practically the result of following the technique of Jansen of Berlin. A brief outline of the operation, as described in detail at the last meeting of this Society (*Transactions* 1904, p. 89), will suffice.

Insert a post-nasal tampon and hold the tongue forward by a ligature passed through its tip. An opening is then made into the antrum through the canine fossa and enlarged until the antero-lateral wall is nearly completely removed. The bony naso-antral wall is then entirely removed, the mucous membrane on its nasal side being as far as possible preserved. The ethmoid cells and the turbinate process of the ethmoid are then removed. The sphenoid is opened, either through its ostium or through the posterior ethmoid cell; the opening is then enlarged until as much as possible of the anterior wall has been removed, and the cavity of the sphenoid is examined and its diseased contents removed.

The field of operation is illuminated by means of a headlight worn by the operator. Instrumentation is further aided by

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

the insertion of the small finger deeply into the nostril. This combination of the sense of sight with the sense of touch does much toward removing the feeling of uncertainty with which operations on the deeper structures of the nose are usually approached, and is a strong recommendation for the selection of this rather than the intra-nasal route. Bleeding during the operation is usually controlled by gauze tampons dipped in adrenalin solution, although a resort to artery forceps to catch the sphenopalatine vessels occasionally is necessary.

The writer wishes to emphasize the fact that this operation is designed especially for the relief and cure of those cases of chronic multiple sinusitis involving the antrum and ethmoid, or antrum, ethmoid and sphenoid, and is not meant to be commonly performed for disease limited to the ethmoid or sphenoid, or for mild or ordinary acute conditions. Cases *may* occur where the maxillary route can be justifiably used for rapidly and safely opening the sphenoid, e. g., a sphenoid causing grave constitutional disturbance might be inaccessible through the nose on account of some nasal deformity of sufficient magnitude to prevent an intranasal operation; in a case of this sort the writer would certainly perforate a healthy antrum to reach the disease.

The following points are to be emphasized: The bony nasomaxillary wall should be completely removed. The opening into the sphenoid sinus should result in the destruction of practically all of the anterior wall, and at times even of part of its floor. The curettement of the ethmoid cells should result in their complete ablation, and this point should be particularly noted, even though the *lamina papyracea* is thin or the *cribriform plate* is near at hand. The presence of these structures teaches us that any operation in their proximity must be so complete as to insure that the region may subsequently be kept surgically clean, and these conditions are secured only by the total ablation of the structure involved.

The surgery of the ethmoid labyrinth is to be compared with that of the mastoid cells. Who, in these days of modern technique, would hesitate to remove the zygomatic cells because, forsooth, the dura might be exposed; who would hesitate to clean out all of the mastoid cells down to the very inner table, because the lateral sinus might be endangered? These questions of the surgery of the ethmoid labyrinth are those of technique, but a technique that must be governed always by

accurate anatomic knowledge and that judgment that comes only by experience.

The writer has performed the operation, as described above, twenty times. Fourteen of the cases were reported to this Society at its last Annual Meeting (loc. cit.). Since then the operation has been performed on six other cases of multiple sinusitis.

Of the cases reported last year two are dead—one from tuberculosis as previously reported, and one from exhaustion consequent to a malignant disease (epithelioma) of the accessory sinuses. Of the remaining twelve cases, seven are entirely well. In these seven cases, pus—the thick, creamy variety from which they had suffered before the operations—did not appear during the attacks of coryza or grippe to which they have been subjected, although the secretions were decidedly mucopurulent in character on both sides during the attacks.

There has been a complete lack of crust formation in these seven cases. The patients have not experienced discomfort and are enthusiastic as to their condition. Of the five remaining cases of those reported last year, one has had an accumulation of pus in the sphenoid sinus. This pus manifested itself in the form of large crusts distributed throughout the nose; removal of these revealed fluid pus exuding from a narrow slit scarcely large enough to admit a probe. This slit was all that remained of the large sphenoid opening made at the time of operation. A second case of almost complete closure of the sphenoid was noted, and was accompanied by a third return of "*tic douloureux*," from which the patient had been relieved twice before by operation on the sphenoid. The pus in this case also formed large crusts. The "*tic*" disappeared on the free opening and after-treatment of the sphenoid sinus. In both of these cases, the pus and crusts did not reform after freely opening and curetting the sphenoid. In the two other cases, persistent, troublesome crust-formations were noted, which were finally traced, in each case, to empyema of the frontal sinus. Operation by a combination of the Kuhnt and Luc methods on the frontal sinuses resulted in a complete cessation of crust-formation and the patients now are perfectly well. The fifth case of crust-formation was found to be dependent upon specific disease and responded promptly to treatment. It is but fair to state that in three of these five cases, on account of a slight accumulation of secretion or

small crusts in the nose, an occasional douching must still be resorted to. These three cases, however, had atrophic mucous membranes before the operation. In two other cases and occasional dryness on the septum and a slight crusting on the posterior pharyngeal wall occurs, but is easily prevented by the use of vaseline.

Thus it will be seen that, of the fourteen cases reported last year, the present condition of seven is what may fairly be called normal. Five of the fourteen cases still have to resort occasionally—and by occasionally I mean every two or three or four days—to a nasal douche or the insertion of vaseline, on account of dryness. Three of the cases, however, had distinctly atrophic mucous membranes with crust-formations before the operation and their condition has been vastly improved by the operative interference.

It will be remembered that in last year's report (*loc. cit.*) several of the early cases operated upon had to have supplementary curettage of overlooked ethmoid cells to relieve pus and crust-formation. These cases have since done well and are cured.

Of the six cases operated upon since June, 1904, one was a case of right-sided acute pansinusitis of one month's duration. The infection was probably due to grippe. The patient, a man of 30, had been treated conservatively for a month by two able rhinologists, one of whom advised a radical operation on account of constant pain and the symptoms of pyemia. At the operation (December 23, 1904) the antrum, ethmoid and sphenoid were found filled with pus and granulation tissue. The frontal sinus was entered through the ethmoid cells via the antrum and the nose. In this manner free drainage of the frontal sinus was established. It was hoped that this would suffice for the cure of the frontal disease. It did not, however, and four weeks later, on account of elevation of temperature, persistent pain and constant reinfection of the nose from the pus from the frontal sinus, the latter was opened by a combined Kuhnt and Luc operation. The sinus was found to be full of pus and edematous granulation tissue, although free drainage had been established at the first operation, thus showing that drainage alone will not always suffice to effect a cure, even in acute cases of frontal sinusitis. Healing was interrupted by the partial closure by granulation tissue of the nasofrontal opening, which was readily corrected by curetting under

cocain anesthesia, and the case then made an uninterrupted recovery. There has been neither treatment nor discharge for the past three months.

The five other cases—all of chronic multiple sinusitis—had been under the care of many rhinologists. Two of them had atrophic membranes and three had polypoid degeneration. Lack of time prevents further description. They are now well, although two must resort occasionally to the nasal douche and one must use an oil-spray for the dryness in the pharynx.

Where crusts have been found after operation, in the cases cited, they have been traced in each instance to suppuration in a sinus or cell, either frontal, ethmoid or sphenoid. In these cases the writer has failed to find suppuration in the antrum after operation—excepting in one case where the bone from the inferior turbinate was incompletely removed at the operation; its exfoliation was followed by cessation of pus formation. The writer's experience teaches that the more complete the removal of the ethmoid cells, the less likelihood is there of postoperative suppuration or crust-formation. He is confident that the results obtained in these cases could not have been accomplished by intranasal work, for the majority of the cases had been treated for years by many different nasal methods. This route affords advantages that cannot be obtained by the intranasal operation. It is safer because it affords much more room for instrumentation; it permits not only of inspection of the field of operation, but also allows of the digital guidance of the instruments, either through the nose or through the wound; and it renders easy the control of the severe hemorrhage that is so apt to occur from the speno-maxillary vessels; finally, it permits of a thorough exenteration not only of all diseased structure but also of structures that may be a hindrance both to drainage and to after-treatment.

Injury to the dura, brain or other important structures, is an ever-present possibility in all extensive operations on the ethmoid cells and sphenoid sinus; indeed, it is not unlikely that disease itself reaches to and affects these structures in some cases. These dangers of themselves are sufficient warrant for the selection of a route that will assure the greatest accessibility, the cleanest, smoothest wounds, the best drainage and the greatest facility for after-treatment.

The twenty cases operated on show the following results:

Eleven cases have been cured: Seven for two years, two for one year, one for six months, one for four months. Three of these were cases of unilateral pansinusitis.

Five cases with atrophic mucous membranes before operation still have to resort to occasional douching. They are much improved. Two of these cases are specific and the crust-formations are controlled by constitutional treatment; and one has frontal sinus disease, accounting for the persistent crusting and pus formation. Even this case is vastly improved.

Four cases of "*tic douloureux*" have been cured.

Nine have had grippe and four coryza without harm resulting.

Fifteen have had marked interference with the sense of smell on the affected side.

One has had stricture of the tear duct, cured by probing through the canaliculus.

Two have disappeared from observation, but were in good condition when last heard from.

XXVIII.

THE EXTERNAL^o OPERATION FOR THE RELIEF OF ETHMOIDITIS.*

BY LEWIS A. COFFIN, M. D.

NEW YORK.

The ethmoids may be independently diseased, or they may be associated in their disease with any or all of the other accessory sinuses of the same side of the head. Both sides of the head may be simultaneously diseased, but I would hardly think of the two sides as associatedly or dependently diseased. Therefore what is said in the following paper refers to one side of the head.

Just what operation should be done upon the ethmoids will depend not only upon whether the disease is restricted to the ethmoids or is associated with disease of other sinuses, but upon the extent and location of the ethmoid involvement, as well as upon what other sinus or sinuses are involved. The condition of the turbinated bodies also should be taken into account in deciding upon the method of operation. Two general principles should guide us:

First: All diseased parts or cells must be reached and treated.

Second: No healthy part should be sacrificed if it can be saved.

If these principles be sound, then it seems to me that, granting that both the intranasal method of operating on the ethmoids and the method of attack through the antrum have their proper place, the method of cleaning out the ethmoid labyrinth or tract through an external opening through the nasal process of the superior maxillary or through the os planum must be in a vast majority of cases the operation of choice. In those cases where the most anterior cells are diseased or where the ethmoidal cells extend over the orbit, it should be the rule, and in children previous to the descent of the second teeth, it is the operation of necessity.

By this method every cell and the sphenoidal sinus can be easily reached and at every point the field of operation is

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

directly under the eye of the operator. This can be said of no other operation. As frequently happens, the turbinated bones, both the middle and the inferior, are not diseased. By operating by the external method neither of these structures need be sacrificed. This cannot be said of any other operation. If, as we sometimes see, all the structures of the nose, together with its accessory cavities be extensively diseased, it makes but little difference what the operation is so long as we operate thoroughly and to this end it may be necessary to resort to a combination of all the known methods of operation. In a pan-sinusitis, or in any case of ethmoiditis, where it seems necessary to open the frontal sinus, the operation of the ethmoidal region through external opening is the logical complement of the frontal operation. If the antrum be simultaneously diseased, it may be operated at the same time that the fronto-ethmoidal operation is done, or it can be left in the hope that the cavities above it, having been cleaned out, it will take care of itself. At the most, a simple Luc-Caldwell operation allowing of curettage, treatment and good subsequent drainage, is all that is required, and it seems to the writer that the person operated upon comes more nearly to having what can (be called) a nostril than when all the accessory cavities have been turned into one large irregular hole. My preference for the external operation over the intranasal operation is for the following reasons:

First: By the intranasal operation the middle turbinate must be sacrificed.

Second: The intranasal operation is long drawn out and painful.

Third: There are certain parts of the ethmoidal tract that cannot be reached by intranasal method.

The Operation.—In doing the operation one should make a curvilinear incision from above the inner end of the eyebrow across the side of the nose to end about one-third of an inch below the inner canthus of the eye. The incision is carried through the periosteum which should be freed from the bone on both sides of the wound and the flaps or sides held apart by retractors, and an opening into the anterior ethmoids is now made by chisel or trephine through the nasal process of the superior maxillary bone. The ethmoid cells are easily broken down by either curette or forceps. Personally I prefer the curette. Injury to the tear sac or duct or to the cribri-

form are unfortunate accidents, and one should be watchful that they do not occur. In a recent case operated by me injury was done to the everted tear sac by a sharp retractor. To avoid injury to the cribriform during all the earlier part of the curettement, the back of the curette should be kept toward that bone, and all force should be directed downward and toward the median line. When the cells have been pretty thoroughly broken down I am in the habit of smoothing and cleaning up the cavity with a ring curette.

If the whole intranasal structure be so thoroughly diseased as to demand the removal of the entire contents of the nasal cavity it should be done, and the external wound immediately closed. Primary union and no deformity is the rule.

If on the other hand, the turbinates are preserved, the operated cavity may be packed and obliterated. An insignificant scar will mark the point where wound was kept open for packing. Several cases so treated have given most satisfactory results. In the last case which I did, I closed the external wound and packed the operated ethmoidal cavity through an opening in the region of the bulla ethmoidalis. The entire ethmoidal labyrinth was obliterated, the middle turbinate was preserved, and I think from an intranasal standpoint it was the most satisfactory operation in this region that I have done. This was the case in which the tear sac was injured so that it became necessary to remove it. There is a considerable flowing of tears over the lower lid which keeps the cicatrix over the side of the sac in a more or less reddened condition; otherwise the cosmetic results are perfect. We expect to remove the tear gland and thus prevent the tearing.

In closing, I wish to state that I should not, except in children, operate by this method unless the anterior cells were involved.

FURTHER EXPERIENCE WITH RADICAL OPERATIONS FOR FRONTAL SINUS DISEASE.*

BY WOLFF FREUDENTHAL, M. D.,

NEW YORK.

Since my last report on the radical operation for empyema of the frontal sinus was read, just a year ago, I have had occasion to operate on four additional cases, the results of which I have the honor of presenting to you today. This number of frontal sinus affections may appear large as occurring in the practice of one man within a period of twelve months, but when you learn that one of the cases operated upon had cold applications. But would it be wise now-a-days to con-perityphlitis—all of which recovered under the use of hot or was an old one in which a relapse had taken place, and that in another I was called in by a general surgeon, the number of new cases becomes reduced to two. I have had some peculiar experiences in these operations, which it seems to me are of importance to anybody engaged in work along these lines. During the last year I have performed Killian's typical operation in two cases and a modified Killian in two.

As to the indications for a radical operation, there are still strong differences of opinion. Extremists are found on either side. Although aware of the fact that some colleagues operate far too often, we are not justified in saying, as some do, that in former years when radical operations were unknown we treated frontal sinus disease without fatal results and that this should be a warning to us now. By analogy we could say: Formerly we did not operate for appendicitis, and yet, to judge from the experience of some physicians, nobody died of that disease. I myself, while house surgeon at the military barracks at Freiburg in Germany, saw a good many cases of tradict an experienced surgeon, if he should propose appendectomy? Undoubtedly normal appendices have been removed unnecessarily, and such mistakes will happen in operating on the frontal sinus as well. The main question for us to

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decide is, can we by operation, save a given case which otherwise would be doomed? The answer to this is "yes," simply because we are now able to make a diagnosis of frontal sinus affections more readily than we could ten years ago. I am convinced that many a patient was left to die with the diagnosis of cerebral abscess or the like, which now-a-days could be saved by operation.

But there is another point which is of importance here. Suppose we have a case of empyema of the frontal sinus, in which drainage into the nose can be established only imperfectly. Have we any knowledge of the time it takes for the pus to corrode the bone and perforate into the dura? There is surely a possibility of meningeal infection in postponing surgical intervention. I must quite agree with Beaman Douglass that in these cases a pachymeningitis may set in at any time and cerebral lesion follow as a result of nasal suppuration, for we cannot "claim that, with the free lymphatic and vascular anastomoses which exist between the nose and the brain, this part would escape involvement from a simple extension of the inflammation." Surely the case reported by Panas should be a warning. His patient died of meningitis, and examination of the pus showed that the sinus suppuration was due to staphylococcus aureus, while that of the meninges was due to streptococcus—a secondary infection. The perforation was in the floor of the orbit through the lesser wing of the sphenoid (See Stucky, *Lancet-Clinic*, December 17, 1904).

Nor, in this connection, should the fatal results reported by Dreyfuss and others be ignored. Severe "brain" symptoms are, I believe, not unusual in these chronic cases of frontal sinusitis. Let me remind you of case 4 reported by me (*Jour. Am. Med. Ass'n.*, February 11, 1905). That patient often felt like jumping out of the window, a sensation that has not returned since he was operated on eighteen months ago.

Another case, that terminated fatally, is the following: Mr. S. S., fifty years of age, was suffering from nasal polypi and frontal sinusitis. The polypi were removed in New York by me, and in Paris, London, Vienna, etc. A radical operation was not proposed by anybody. One day, while out west, he awoke with much headache which grew worse steadily for six days, when he suddenly committed suicide. From the time his headache became intense, the nasal discharge ceased and there was undoubtedly a retention of pus that was the cause

of the mental aberration. Although unable to bring forward any direct proof of the truth of my statement, I am convinced nevertheless that it is so.

A third case is that of I. P., 25 years of age. Since the age of four years, he had had nasal trouble, evidenced chiefly by profuse discharge, foul odor, pain and headache. This was neglected until his fourteenth year. Then he was treated with cleansing lotions, etc., without any improvement. Two years ago the radical operation was performed by a well known London colleague, but the patient derived no relief from it whatever. He is a conductor on the "L" Road and told me he asked some of his fellows to keep an eye on him, as he is afraid something will happen to him. He has now double frontal sinusitis with imperfect drainage, but dreads another operation.

All these cases give us a warning to be on our guard constantly. On the other hand, I am convinced that there are thousands of people going about with chronic empyema of one or more of the accessory sinuses, where we would not think of resorting to a radical operation. No doubt every one of you has such cases under treatment. Thus, for example, the brother of Mr. C. M. (Case No. 4) has been treated by me on and off for the last four years for nasal polypi. He comes to see me whenever he is unable to breathe any longer through one or both sides of the nose. At such times, as a rule, his headache becomes so severe that he can hardly attend to his business. He has unquestionably a chronic empyema of both frontal sinuses. After a large part of the polypi are removed and his symptoms leave him he stays away, feeling comfortable, as free drainage becomes established. During the summer months he takes his ocean baths and does not know that he has nasal trouble. I have never thought of proposing a radical operation to him, and he may go on in this way for many years to come and perhaps may never require any radical intervention. These radical operations are always dangerous, since a great many serious and even fatal accidents have happened. In this country, as far as I am aware, very few fatalities have been recorded, while abroad, so skillful a man as Luc, reports five out of his first thirty operations. While cases in which there is nothing left for us to do but to perform a radical operation. This was done with excellent results in *Case I.*

Mrs. A. S., 68 years of age, has complained for the last fifteen months of diplopia. She has also had "for years a very bad catarrh." During the last year she was treated for it by a colleague and the "catarrh improved," although she admits that she has to syringe her nose three or four times a day in order to feel comfortable. Her visual disturbance, however, did not subside. When I saw her, in consultation, she was suffering from extensive proptosis of the left eye, which was pushed forward and towards the temporal region. The anterior and part of the posterior portion of the middle turbinated body had been removed and pus was coming from the infundibular region, the origin of which was found to be in the frontal sinus. This lady absolutely persisted in having an operation performed, as she was afraid of losing her eyesight. Besides, she was very anxious that her eye should regain its former appearance. At the beginning of June, 1904, a Killian operation was performed. The frontal sinus extended only a little above the eyebrow and was filled with granulation tissue and pus. After chiseling away the frontal process all the ethmoidal cells were easily removed, as they presented hardly more than a mass of broken down tissue. The sphenoidal sinus was also cleared out and the external wound closed completely. In spite of her advanced age, this patient made an ideal recovery. Within ten days she was out of the hospital, the discharge from the nose persisting in a mild degree for about six weeks more. Now she feels perfectly well, has no nasal discharge, the proptosis has also disappeared, and there is only a slight scar to be seen on the side of the nose—together, as I said, an ideal case.

The narration of the second case I shall omit, as it offered no special features of interest.

In regard to the third case, a man of 31 years of age, whose frontal sinus did not reach above the eyebrow, I would mention only that on scraping away necrotic tissue, I exposed the dura. I do not consider such an occurrence of much importance as long as you do your work aseptically. The man's highest temperature after the operation was 100 F. He left the hospital on the ninth day after the operation.

Hitz, of Milwaukee, reports a case in which he exposed the dura in two places and the patient got well (*Laryngoscope*, April, 1905).

Quite in contrast to these cases is *Case IV*, which I will now

report, and which I believe will interest every one here at this meeting. It has been described in part of my previous paper as Case III, and I will briefly repeat the history here.

Mr. C. M., aged 40, a wholesale merchant, consulted me over two years ago, with quite acute symptoms. He told me he had been unable to breathe well through his nose for the last three or four years. Whether there was pus present during all that time he did not know. Three months ago nasal polypi had been removed in several sittings by a colleague. After the last seance he had "dreadful" headaches. But later it seemed as if something had broken, and an abscess opened, and he then felt easier. About ten days ago this pain returned. It was so severe that he could not sleep at all. For the last two days he felt, on the contrary, like sleeping all the time, although the pain had not left him. He was somewhat dizzy, so that his wife had to lead him into my office, his mind did not seem to be perfectly clear, and he answered questions put to him rather slowly and hesitatingly. Temperature, 101 F. No appetite.

Examination.—On examination I found the parts over the right frontal sinus swollen, and the right eye somewhat closed. Great tenderness to touch at supraorbital margin. Transillumination showed shadow on the right side. In the nose there were several polypi and a mass of pus. Considering the seriousness of the symptoms, I advised an immediate radical operation, but the patient preferred to wait. This gave me an opportunity to remove the polypi. He was growing weaker, felt like vomiting, etc., when, after eight days, his family consented to an operation.

Radical operation after Kuhnt. Eyebrows shaved, horizontal and vertical incision. Periosteum drawn upward and downward; sinus opened above the eyebrow. The cavity, which was filled with pus and granulation, was not very large. The entire anterior wall was affected, and consequently removed, and the rest of the cavity thoroughly scraped out. Drainage into the nose; My'es' tube inserted and sinus packed with gauze. Patient made an uneventful recovery.

So much for the old history. Nine months later he returned to me with mild symptoms of headache, obstruction in the nose, etc. After curetting some of the ethmoidal cells and washing out the frontal sinus he felt well within two days and did not return until six months later. The same symptoms, the same treatment, and the same good result.

On April 12, 1905, I saw him again, his symptoms being much aggravated. The whole right side of the head was painful, especially the right supraorbital region, which was swollen and very tender to the touch. Temperature 100.5; some dizziness. We tried everything to relieve him, but did not succeed this time, and it was evident with the symptoms growing worse quickly, that another radical operation would have to be performed. Apparently Kuhnt's operation had not been thorough enough in this case, and the family hesitated to have him subjected to another more radical one. Still from intranasal methods no relief could be obtained. His headache became very intense, sometimes he felt like vomiting and it was apparent to everyone that his life would be lost unless the sinus was opened from the outside. This was done on April 13, 1905, at 7:30 a. m., and a typical Killian operation was performed. On opening the sinus we found it to be quite large, extending to the external margin of the eye. Undoubtedly at the last operation after Kuhnt when we found the sinus to be small, a pocket which was partitioned off from the rest of the sinus was not seen and been overlooked. This partition had now broken down so that the whole large sinus was exposed to view. This was easily explored in all directions and freed from the large mass of broken down tissue, etc., that filled every crevice. Then the other steps of the operation were performed exactly according to Killian. Before closing the wound we probed the sphenoidal sinus. This was done by myself as well as by my assistant, and the sinus found intact. There was no reason, therefore, to enter it. Furthermore, it must be mentioned that there was no communication between the frontal sinuses, nor was any communication discovered further down on the septum. The operation had lasted more than two hours. The pulse was bad from the beginning and throughout the operation. After the patient was put to bed he had a collapse, which subsided after injections of strychnin, camphor oil and saline solution, with whiskey per rectum. In the afternoon, he vomited once about one ounce of a dark fluid, but on the whole passed a comfortable day. During the night he was somewhat restless and slept at intervals. When I saw him the next morning (temperature 101), he told me he could not see with his left eye, i. e., on the side that was not operated upon. I changed the dressing immediately, and not only found the wound healthy, but the patient now said he could see. Consequently

the wound was dressed again as before. Still, when he once more told me the following day that he could not see with his left eye, things began to look more serious. Again the wound was dressed and all accessory sinuses examined most carefully. Nothing was discovered out of the way. Both sphenoidal sinuses were intact. I went over every step of the operation with my assistants, but we found nothing that we would not repeat in another case. Dr. Henry S. Oppenheimer was called in consultation, and expressed the opinion that a fracture must have occurred somewhere near the foramen opticum in consequence of the chiselling of the bones—a contre coup. The Doctor was surprised that such occurrences did not happen more often. Still, there were other possibilities, and I must confess that I had always hoped that this case would turn out to be one of hysteria, as one of the gentlemen firmly believed. I regret to say that the future development proved Dr. Oppenheimer's diagnosis to be correct. Dr. Charles F. May, who had also seen the patient the day after, practically concurred in Dr. Oppenheimer's views. I gave the patient potassium iodid and ordered absolute rest. On the fourth day after the operation when the wound was dressed, a small stitch-hole abscess was seen at the inner angle of the orbit (temperature 100, F.). This gave us no trouble and on the eleventh day the patient was allowed to go home with a small strip of gauze in situ and adhesive plaster over the small wound. He felt so well that he committed some indiscretion at home, in consequence of which the dressing came off completely during the night. A secondary infection set in, which manifested itself on the third day afterwards in a profuse purulent discharge. It required several weeks of treatment before we mastered the situation, fortunately without the sinuses being affected.

The last report received from Dr. Oppenheimer, June 4th, 1905, says that there is complete atrophy of the optic nerve.

We therefore can have no doubt that there was a fracture about the foramen opticum, causing pressure upon the optic nerve.

In the beginning, when nothing abnormal could be detected in the retina, there were other possibilities open for discussion. The first was hysteria, which was soon excluded, as well as acute retrobulbar neuritis. Another and most important point was the possibility that there had been pus in the right sphenoidal sinus,

which had broken through the septum into the other sphenoidal sinus. I thought of that possibility at once, remembering the very interesting case of sudden blindness reported by T. H. Halsted of Syracuse, N. Y. In this case there was an empyema of the right maxillary, ethmoidal and sphenoidal sinuses, which gave occasion to no ocular symptoms until suddenly blindness developed on the opposite side. This patient was cured by treatment directed to the right sphenoidal sinus. In speaking of the anatomy of this region, Halsted says that the thinnest of all is the plate of bone which separates the sphenoidal sinus from the optic foramen, transmitting the optic nerve and the ophthalmic artery. Considering this thinness of the bone, one must be "struck by the infrequency of reported cases of optic neuritis and blindness resulting from sphenoidal suppuration and abscess, and it must be due to the fact that this sinus and its diseases have been greatly overlooked or underestimated as to their ability to occasion eye diseases." (*Archives of Otolaryngology*, 1901, p. 222.) Undoubtedly such cases have occurred, but have been overlooked. In our case, however, there was no such accident, and the only possibility left is a fracture near the optic foramen. Cases are on record in which, as the result of a fall upon the nose or the forehead, such a fracture was caused simply by contre coup, and it is surprising that it has not been noticed before in consequence of chiseling and hammering of these parts. If such accidents should be of frequent occurrence, that would be a strong contra-indication to radical operations of any kind on the frontal sinus. In our case the life of the patient would have been endangered by postponing the operation, and even if we had thought of the possibility of such an accident, we were compelled to risk the loss of one eye rather than that of his life. To avoid such contre coup fracture in the future, it may perhaps be wise to place the head of the patient on a soft and somewhat elastic cushion in order to diminish concussion during the operation.

TWO SUCCESSFUL CASES OF OBLITERATION OF THE FONTAL SINUS AFTER REPEATED OPERATIONS.*

BY H. HOLBROOK CURTIS, M. D.,

NEW YORK.

The two cases which I present, illustrate the importance of total obliteration of the frontal sinus, as the only sure method of guarding against recurrence of the suppuration from reinfection. The first case was referred by his physician in a western city, to Dr. Charles S. McBurney, and by him sent to me for a radical frontal sinus and antrum operation. The letter giving an interesting history of the case by his own physician reads as follows:

"Dear Doctor:

About five years ago Mr. B. had the grip, at which time he had some swelling and puffiness under the right eye over the right maxillary antrum. There was pain over both antrums. Some time after that both antrums were drilled into after removing the second molar tooth on each side. Pus was found in each antrum. These were douched. Within two months the left one recovered and the discharge stopped; two years later the left antrum was again drilled into and pus found. In the right one the discharge ran along a year and finally stopped. At intervals of from six months to a year the right antrum was again drilled into up to November, 1901, when the present opening was made in the incisive fossa. All this time there was a great deal of pain. The pain was located under the right orbit, over the frontal sinus and at the top of the head. The pain in the top of the head extended to the occipital region. The pain has always been worse in damp weather, and preceding a storm. After a day of unusual mental effort, the pain is increased.

Mr. B. is very susceptible to pain, although he has great powers of resistance. For a number of years, at intervals of perhaps two weeks, he suffered intensely from sick headaches, which were sufficient to put him in bed. For a great many years he has had nightmare; he hollows, and runs about in his

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

sleep, and, to one who does not know him, it is quite alarming.

Mr. B. came under my care on the 22nd of February, 1902, at which time he had the present opening in the right maxillary antrum, which was excreting from a teaspoonful to two teaspoonfuls of pus in twenty-four hours. The left antrum was also excreting pus in smaller quantity. He was suffering very much from pain under the right orbit, under the left orbit, in the frontal region extending across the brow, and in the top of the head and occipital region. The condition of both antrums had been properly diagnosed. In probing the right antrum, an opening was found at the upper, inner and anterior portion of the antrum, through which a probe passed into what was at first thought to be the anterior ethmoidal cells. Afterwards it was determined that this probe passed into the frontal sinus. An X-Ray examination revealed this fact, as well as the presence of the point of the probe in the frontal sinus when the operation of opening it was made. Trans-illumination never showed the frontal sinuses dark. The character and location of the pain led me to believe that more than the antrum was involved. To confirm this the anterior half of the middle turbinate was removed April 8, 1902. The anterior ethmoidal cells were found to be diseased, and pus came from them after the removal of the middle turbinate. No pus was found in the nose at any time prior to this, to help locate the disease. The anterior ethmoidal cells were curetted and an unsuccessful effort made at this time to wash out the frontal sinus through the nose. September 22, 1902, the frontal sinus was opened at the point indicated by the present wound. The opening made into the bone was about three-eighths of an inch in diameter. The frontal sinus was found to be filled with granulation tissue which was very dark and bled easily. An effort was made to curette the whole frontal sinus on the right side. The opening into the nose from the frontal sinus was made free and large so that there was free access between the sinus and nose. We irrigated the frontal sinus and the antrum at intervals of from 24 to 72 hours, using sterile water, or sterile water containing boric acid, or Borolyptol, or Formaseptol, or equal parts of bi-carbonate of soda, bi-borate of soda, and chlorate of soda. The odor of the discharge at first was quite offensive. Recently the discharge has almost subsided, and there has been very little or no odor. By reason of the continuance of the pain the posterior

half of the middle turbinate was removed from the right nostril about February 1, 1903, and some of the posterior ethmoidal cells were broken down and more of the floor of the anterior ethmoidal cells was cut away. Pus was found in the posterior ethmoidal cells. The sphenoidal cell has been probed a number of times and the ethmoidal cells were cut away. Pus was found in the posterior pharynx at intervals extending over the observation of this case, without at any time finding evidence of involvement of the sphenoidal sinus.

The left antrum was irrigated through a puncture in the nose and has not discharged any for the past six months, although the pain over the left antrum has been as severe at times since then as at any time when it contained pus.

Not more than five or six drops of pus have been washed out of the frontal sinus and right antrum at any recent washing. In spite of this fact the pain has not diminished at all. If there is any difference in the degree of pain, it seems that it has been worse for the past five weeks. Recently the frontal sinus has been irrigated through the nose.

As a boy Mr. B. had a periodic internal strabismus in which the left eye was the offender. He has an esophoria and a compound hypermetropic astigmatism in each eye. Repeated ophthalmoscopic examinations have shown normal fundi.

Recently there has been considerable pain in each ear which has seemed to be in excess of that which would be expected from the local disturbance in the ears themselves.

The question now confronting us is: What is still producing the pain? Is it due to pus still retained in some cell or cells that have not been opened? Is it due to the inflammation that is still present, though not sufficient to cause pus? Or, is it due to the presence of the plugs which evidently produce more or less irritation to the branches of the fifth nerve?

Yours truly, J. L. M."

When the patient came to me he was wearing a gutta percha obturator in his right canine fossa perforation and a similar contrivance through the interior wall of his right frontal sinus, to keep the wounds open for the purpose of douching. The latter plug he had worn for several months. His right antrum was discharging pus as was also his frontal sinus; the left antrum was causing much pain, but the discharge was not appreciable in the middle meatus. Most agonizing and con-

stant pain was a marked characteristic of this case throughout. The right eyelid was indurated and inflamed from the obturator. There seemed every indication for a Killian operation upon the right sinus, but the condition of his eyelid and the inferior wall was such that I did not see my way clear to making a flap which would be satisfactory. I determined, however, to attempt to save the superciliary ridge to prevent deformity and though the bone was very necrosed below the ridge I elected to enter the anterior wall. The patient was anaesthetized by Dr. Denton and I operated as follows. The incision was from the root of the nose on a line above the eyebrow rather higher than usual as you see by the photograph,



Fig. 1.



Fig. 2.

having ascertained previously that the sinus was a very large one and extended three-quarters or an inch above the ridge. The sinus walls were found luxuriant in granulation tissue of most unhealthy type, with necrosis of the anterior wall and almost complete destruction of the inferior plate. I cleansed the sinus and curetted the anterior wall in the supraorbital portion, which I preserved as a thin bridge. I then dissected out the old wound in the inferior tissues beneath the ridge and removed the entire inferior wall. The next step was the breaking down of the posterior ethmoid cells which were badly diseased, clearing out the anterior cells as well. Having done this work most thoroughly, I decided to attempt to obliterate the sinus by packing. The condition of the soft tissues in the

orbital region was such that it was impossible to attempt to close the old wound so I left both incisions open and after careful washings with peroxid packed the entire cavity with iodoform gauze. After a week I succeeded in closing the inferior wound and obtained a primary healing. For eight weeks I carefully packed the sinus with iodoform wool which I have previously described, using this after the first dressing of gauze. This I consider the very best dressing for exciting granulations. Little by little the granulations approached and tended to close the nasal orifice; the moment this was accomplished the sinus filled up with great rapidity and the frontal wound was closed after slight paring of its edges at the tenth week. The point I wish to make is this: Obliteration of the sinus is the objective point to be attained in frontal sinus work, and if patience and discretion are used in packing, this object may be accomplished even in very large cavities with extensive ethmoidal complications. I will not detail the operations on the antra and the sphenoid sinus in this case, which were performed after the dread of reinfection was removed by obliteration of the frontal sinus. Suffice it is to say that an individual to whom life had become unendurable, has been relieved of his suffering and able to comfortably carry on the arduous duties of secretary of an important financial institution in the west. I will say that the photograph is taken to show the cicatrix and that the scar on the individual is not as prominent as it appears to be in the picture.

Case II.—I wish to cite a case which like the last, has been through many hands, but continued failures always took place from the fact that the sinus as well as the antrum, became constantly reinfected. A description of the case by a colleague in Philadelphia, may be of interest:

"Mrs. K. has had empyema of the right frontal sinus and of the right antrum of Highmore for one year at least, though there is a history of neuralgia dating back three years.

In December, 1895, shortly after she first consulted me, I removed one-half drachm of thick muco-pus from the right maxillary sinus. While the antrum steadily improved under the frequent irrigation through the ostium maxillare, the frontal inflammation got steadily worse.

Numerous small polypi were removed from about the naso-frontal duct, but at no time was any pus seen there.

Transillumination of antrum positive, of frontal negative.

Frequent attacks of inflammation of the frontal sinus, causing marked edema over the cavity, occurred with extreme pain at the time but lasting only a day or two very severely. These attacks becoming worse and more frequent, the frontal sinus and antrum were opened under ether. The frontal cavity was filled with small polypi or granulations and some thick pus, the antrum contained thick muco-pus. The floor of the frontal sinus was broken through into the nose and a rubber drainage tube passed through and out at the nostril. Both antrum and frontal were packed with iodoform gauze, the former daily for over four weeks.

The drainage tube was removed on tenth day and a horse-hair drain substituted for a couple of days longer.

At the time of operation, I endeavored to pass a filiform bogie through the nasofrontal duct, but it was either markedly stenosed or entirely obliterated.

With a curved delicate probe one can now enter the cavity through the new opening which is beneath the extreme anterior end of the middle turbinates.

When the flow from these cavities was obstructed, before the operation, Mrs. K. had very severe neuralgia of the right side of the neck and in the right ear. There was seldom complaint of pain over the antrum, and over the frontal except during the attacks, which were several times a week at first but later once a month. When less frequent, the pain was *severer*.

The tooth is not the cause of the difficulty. It has been repeatedly examined by skilled dentists, a mirror even being used inside the cavity to view it."

This letter was written in 1895 and the patient continued the victim of pain and discharge until 1903 when in December of that year she was referred to me by Dr. Kinnicutt. I operated on the frontal sinus by entering and removing the anterior wall above the orbital ridge, except at the nasal portion where I was obliged to remove part of the ridge itself to obtain better access to the posterior cells.

As this case had been previously twice operated upon through the inferior wall, I was obliged to remove a greater portion of this wall during the operation but preserved the integrity of the soft tissues.

Here as in the previous case I made a very free opening into the nose and packed for some weeks with iodoform wool

until the sinus was obliterated. I then did a slight plastic operation to remove the edges of the cicatrix. The photograph shows the scar to be scarcely visible.

In three weeks I operated on the antrum through the canine fossa, making a very free opening through the inferior meatus for packing. The wearing of obturators through the alveolar puncture which had gone on for years in this case made it necessary to remove much of the floor of the antrum, but I succeeded finally in closing a large buccal orifice and carried out my treatment through the nose until an absolute cure was effected. The patient wrote me a month since that for eighteen months she has had no pain and no discharge from sinus or antrum. The questions of interest which have suggested themselves to me as the result of these and like cases, are these:

1st. Is it ever expedient to attempt to incorporate the anterior sinus wall in a skin flap, after removal of the inferior wall, for the purpose of obliteration?

2nd. Provided thorough asepsis is carried out, the obliteration of the sinus becomes so possible: how often are we ever justified in closing our superficial wound until we are sure that we have secured this end?

3rd. Even with a Killian bone incision. May we not get better results by packing from above and keeping our flesh wound open until we are satisfied with the appearance of the nasal cavity as viewed from above?

4th. In operating on the frontal sinus should not the integrity of the inferior wall be preserved if possible, for two reasons?

1st. The pulley of the superior oblique muscle should not be interfered with, and 2nd, the nervous return through the angular and ophthalmic veins into the cavernous sinus should not be unnecessarily exposed to infection.

It has been my observation that cases of fatal termination have been those in which the inferior wall near the nasal junction has been attached and the infection carried to the cerebral sinuses through the above mentioned channels.

These and similar questions have been discussed from many standpoints, I would simply say that in my hands obliteration of the sinus by packing has more than proved the success I predicted for the method, which I advocated in my paper read before the Society in 1902.

REPORT OF A CASE OF INFLAMED DENTIGEROUS
CYST SIMULATING ABSCESS OF THE ANTRUM
OF HIGHMORE, CAUSED BY AN ODONTOMA.*

BY WILLIAM H. HASKIN, M. D.,

NEW YORK.

The case to be reported is of interest from several points of view and is rather unusual. The history is of a man, W. H. W., 33 years of age, who, as is shown by his letter, suffered with neuralgia as far back as 1893, and so severely that he had all his teeth extracted on the upper jaw, although only four of the front teeth were decayed. The cure of the neuralgia was apparently effectual, and with a full upper indenture he was comparatively comfortable for years, but there developed another condition which was due entirely to his original disease and was probably the cause of the neuralgia.

I give his letter to me in full:

"The following is an account of conditions relative to present trouble, existing from the time I had my upper teeth extracted in 1893. As far as I remember, I had four (but possibly five) badly decayed teeth in the front of the upper jaw, the others being in good condition. I had suffered for years with intense neuralgia, always on the right side of my face. I could get no relief from medicines and finally consented to the extraction of all my upper teeth.

From that time till July, 1903, I had no trouble and wore a full upper indenture with perfect comfort. Then a small hard lump appeared about the place of the present trouble, which was very painful and interfered with mastication. The dentist relieved the pain by adjusting the indenture, and I had no further trouble until September, 1904, though the swelling became considerably larger during that time.

September 1st an abscess developed at the seat of the swelling, which broke at the end of eight days and refilled three days later, breaking a second time at the end of seven days. I then consulted first a doctor and then a dentist, both of whom said that there was decayed bone present, and on the advice of the dentist I write to ask when I may call at your office.

W. H. W."

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

September 29th, 1904, he came to my office. Close questioning elicited no symptoms of antrum disease and there was no condition in the nose indicating its involvement. Externally, the right cheek was immensely swollen, with edema of both eyelids. The wall was very hard in the middle but pitted badly around the circumference. Within the mouth the alveolar border presented a normal atrophied appearance, without any fistula or indication of caries. The swelling on the right extended from just above the free alveolar margin below to the malar ridge above, and from the ramus of the inferior maxilla posteriorly to the ala of the nose anteriorly. It presented a smooth rounded surface which seemed to be too hard for a simple inflammatory exudate. Three-quarters of an inch from the free border, at a point opposite the lower bicuspid, was a fistulous opening which discharged pus. A probe entered a large cavity of irregular outline and at several points detected exposed bone.

On September 30th, at the Manhattan Eye and Ear Hospital, under ether anaesthesia, a long incision was made along the alveolus and the periosteum was elevated until the fistulous opening was exposed in the bony wall of the swelling. This wall was very thin and would, I judged, have held a large English walnut very readily. The outer wall was easily removed with rongeur forceps and curettes, although it extended so closely to the malar bone that I felt I was curetting that bone. The inner wall, corresponding to the anterior surface of the inferior maxilla, was covered with granulations, but I could find no opening into the antrum and avoided puncturing it. There was a large amount of granulation tissue in every direction and on both sides of the cyst wall, which was removed with considerable difficulty in places. At the time of the operation I did not detect any unusual condition on the alveolus, though it was carefully scraped to remove any caries. The cavity was then packed tightly with iodoform gauze.

The patient was discharged from the hospital October 4, 1904, and continued treatment at my office.

October 7th, 1904, an abscess developed in the outer wall which threatened to rupture through the cheek, but fortunately did not, as I was able to drain it from within the cavity. There were no unusual symptoms, but on October 18th, in order to cut down exuberant granulations to aid in the re-

removal of a supposed sequestrum at the incision, I used a 50% solution of silver nitrate. On his next visit the probe detected this exposed spot in the alveolus which on examination appeared black, and which on removal proved to be an overlooked root, with a large odontoma involving it.

After this the whole cavity closed rapidly, though several times I packed it with enzymol to remove small areas of exposed bone tissue. I saw him once a week in November, and last on December 12th, 1904, on which date there was no trace of any trouble and he was able to use his upper denture with perfect comfort.

On examination, the root which was removed presented a large odontoma but no evidence of any caries on its exterior, the upper surface being as though recently broken and the root canal being still patent..

This case presents the interesting phase of the attempt to cure facial neuralgia by the extraction of all the upper teeth—although there were not more than four or five decayed ones present—and its apparent success, for there was no return of neuralgia for at least ten years.

The question, however, arises, and most pertinently, whether the removal of the above root alone would not have been sufficient of itself, and emphasizes how careless a dentist can become when he will allow such roots to remain at the time of extraction.

The history I obtained from the patient on close questioning led me to suspect that possibly there had developed a dentigerous cyst in the anterior wall of the superior maxilla. He said that for some months he had noticed a fullness on that side of his face which interfered with the fit of his upper denture, which he has had cut out on two occasions. I believe that the above was the case, but that some inflammation or injury had caused inflammation to return, and the wall gave way, allowing the escape of its contents. He could not tell me the nature of the discharge, so I could not be certain, but the fact that there was a large cavity surrounded by a very thin osseous wall, that there had been no pain with the swelling until just before the wall ruptured on September 1st, 1904, would tend to the diagnosis of a cyst of some sort. If such was the case, it undoubtedly sprang from the alveolar socket that held the odontoma which I have presented to you.

I could present a number of other cases of interest, which have all been caused by the presence of tooth roots, and I believe that in all cases where we send patients to have teeth extracted we should advise them to bring the teeth back to be certain that no roots have been left, and in that way insure ourselves of no further trouble. It surely would be wiser to pursue this course, even though it should cause some necrosis of the alveolus, for that invariably heals promptly and I have never known serious trouble to result.

Dr. Cobb, in 1900, reported several cases of dentigerous cysts in this location, and was surprised at the rapid absorption of the cyst after the contents had been allowed to escape. In this case, owing to the inflamed condition of the whole tissue, I thought it best to remove as much of the wall as possible; and I believe that this should be the procedure followed in all cases, for my experience has always been that if the cyst wall in any case remains, there is always a strong possibility that it will refill in time.

I have carefully examined the Index Medicus for the past three years, but have been unable to find any reports of cases resembling those Dr. Cobb presented and this which I have just reported.

XXXII.

NEW OPERATION AND INSTRUMENTS FOR DRAIN- ING THE FRONTAL SINUS.*

BY E. FLETCHER INGALS, M. D.,

CHICAGO.

Acute suppurative inflammation of the frontal sinus generally heals without operation on the sinus provided obstructions to the escape of the pus from the lower end of the canalis naso-frontalis are removed and I believe that in the majority of cases chronic suppuration of this cavity would soon cease under simple measures if there were free drainage. At all events free drainage is necessary in every case whether or not curetting of the cavity is required, and the more easily this can be secured, the better. In my experience most patients refuse to have an external operation performed, probably on account of their dread of the resulting scar, and they can be driven to it only by intolerable pain or by external deformity due to the disease.

In nearly all cases, a probe may be passed from the naris into the frontal sinus after the anterior portion of the middle turbinated body and any pathologic obstructions have been removed. Whatever operation is to be performed all these obstructing conditions should first be eliminated, therefore, very few cases remain in which a simple and safe intranasal operation that will establish free drainage is not eminently desirable.

I desire to present such an operation for your consideration without taking time to refer to any of the other well known operations. In a word my operation consists of passing a steel pilot through the natural canal into the frontal sinus and running in over this a hollow burr by which a canal six mm. in diameter is made, and then inserting into this canal a self retaining gold tube so large that the pus will necessarily drain and that the patient may easily wash out the sinus.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

In performing the operation, I first introduce a small silver canula and wash out the frontal sinus with a 50% solution of the commercial solution of peroxide of hydrogen, warm; I immediately follow this with a warm saturated solution of boric acid. I then inject into the sinus slowly, five to ten minims of the following solution which trickles down about the canula and anesthetizes the field of operation: Atropin gr. 1-10th, Strophanthin gr. 1-5th, Suprenalin gr. 1-5th, Oleum Caryophylli M. iii, Acid Carbolie gr. x, Cocain Hydrochlorate gr. xcvi, Aqua. Dist. ad. f. oz. i. I then introduce the steel pilot Fig. I, A, which is no larger than an ordinary probe, and with the patient in the sitting position, administer chlorid of ethyl for about a minute which insures complete anesthesia. The handle is removed from the pilot and the hollow burr Fig. I, B, (which has already had a flexible sheath. Fig. I, C, slipped over it and been attached to the chuck of a dental engine) is

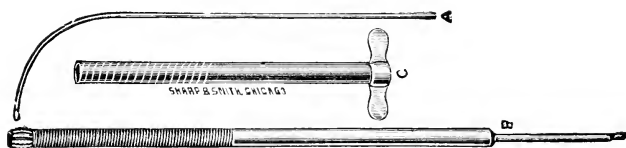


Fig. 1. Ingals' Pilot Burr; two-thirds size. A, pilot; B, burr; C, shield.

slipped over this pilot into the naris and up to the lower end of the nasofrontal canal. Gentle continuous pressure is then made, the electric current is turned on and within a few seconds the frontal sinus has been entered. Before turning on the power one should note just how much of the proximal end of the burr protrudes from the nostril, otherwise he will not realize when it has passed into the sinus and he may waste a lot of time (as I did in one operation) in the futile effort to make it go farther. One cannot recognize the drilling of the bone by either sound or the feeling of the instrument. As soon as the sinus has been entered the burr is withdrawn and a packer (similar to a uterine packer), the end of which has been bent to the same curve as the pilot, is introduced and through it the frontal sinus is packed and dried by a strip of of the whole canal, and this strip is then drawn out, through the packer, so as to avoid cauterizing other parts of the nasal cavity.

absorbent gauze an inch in width which is left long enough to stop any bleeding. The gauze is then withdrawn and a similar strip saturated with 95% of carbolic acid or with a 10-20% solution of chlorid of zinc is introduced in the same way and allowed to remain a few minutes. The packer is then withdrawn about an inch to insure thorough cauterization of the whole canal, and this strip is then drawn out, through the



Fig. 2. Ingals' Spring-gold Frontal-sinus Drainage Tube. The upper tube in the cut shows the upper end opened out. The small cut at the right shows the lower end of the tube. The small cuts at the left shows the diameter of the tube and the gelatine capsule. The lower tube shows the tube with the upper end sprung into the capsule.

packer, so as to avoid cauterizing other parts of the nasal cavity. The gold tube (Fig. 2), the upper end of which has been sprung together and covered with a gelatine capsule, is then slipped on an applicator and passed up the canal until stopped by its lower flaring end. A probe is now pressed up against the end of the tube and the applicator is withdrawn. For recent operations I have used the shield C, Fig. I, which has been made a spirai



Fig. 3. Syringe for Washing Frontal Sinus; two-thirds size.

tube throughout its whole length, to put over the applicator as a check to prevent the gold tube from slipping too far on it. When the gold tube has been placed in the canal it is crowded off the applicator, as the latter is withdrawn, by pushing the spiral tube upward. Within half a minute the gelatine capsule will dissolve and the end of the tube will have opened out so that it will be retained. The operation is then

complete. I give the patient a small syringe with a bent nozzle, by which the frontal sinus can be washed out or medicated. Little or no attention by the surgeon will be needed afterward. The instruments consist of a flexible steel pilot, Fig. I, A, $14\frac{1}{2}$ cm. long and one to one and one-half mm. in diameter which will project 5 to 10 mm. beyond the hollow burr when the latter has been passed up to the farthest extent. This absolutely prevents perforating the top wall of the sinus. A removable handle for the pilot to facilitate its introduction. A hollow burr, Fig. I, permanently fixed to the end of a hollow steel wire cable, six cm. in length which is permanently fixed to a steel tube (like a trephine) the other end of which terminates in a shank for attachment to the dental engine chuck. At the proximal end of this tubular portion where it terminates in the shank, is a small opening in its side to facilitate cleaning. The cutting burr is six mm. long and six and one-half mm. in diameter and is so made that it will feed rapidly and cut any bone with which it comes in contact. The burr might be made larger without much danger of doing harm, but I believe its present size is within the limits of perfect safety and in the light of experience, I can see no reason for a larger drainage canal than this affords. The whole instrument which I have named, pilot-burr, is 19 cm. in length.

It will be observed that the distal end of the pilot is necessarily kept in position by the canal into which it is inserted so that the whole apparatus can not revolve when the burr is turning, and the proximal end is held by the tubular end of the burr so that the operator has the instrument under control. The thin spiral steel sheath for the cable and tubular portion of the burr, Fig. I, C, prevents any injury to the nasal passages due to rapid turning of the instrument. This is flexible so that it may follow any curve that is given to the pilot. A dental engine, rated one-eighth horsepower furnishes the most convenient power though an apparatus to operate the burr by hand might be made. The packer Fig. IV, is a thin tube the external diameter of which is a trifle less than that of the burr.

It is bent to the same curve as the pilot and is very easily introduced through the enlarged canal into the frontal sinus. From the examination of the frontal sinus in cadavers upon which I did the operation, I found that the opening through the mucous membrane lining the frontal sinus was not clear

cut, and was apparently much smaller than the burr, therefore I had a ring knife made on a flexible steel stem wherewith to curette the borders of the ostium frontale; this worked satisfactorily, but since perfecting the drainage tube, I find it unnecessary. The self-retaining gold tube Fig. II is three and one-half cm. long and six mm. in diameter. It is made of spring gold. The lower end has an oval cup-like flange nine mm. long by six mm. wide. From the upper end the tube is sawed down two cm. in six places, making six sections, nearly a mm. of the end of each of which is bent inward at a right angle so as to make the end blunt. About 12 mm. below this upper end

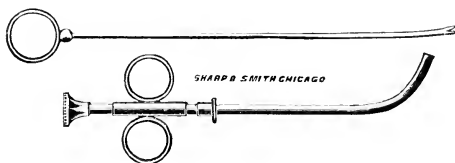


Fig 4. Frontal Sinus Packer; one-third size.

I bend out each of these sections so as to make the upper end funnel shaped and about nine mm. across at the end, which makes the tube self retaining. The slits down the side make each of these sections a nearly flat spring about two mm. wide and two cm. long and renders it easy to withdraw the tube at any time the surgeon may wish. The slits also prevent pocketing of pus about the tube in the lower part of the sinus. The part of a gelatine capsule used to hold these six spring sections together when introducing the tube is a trifle smaller than the outside of the gold drainage tube. The applicator is a bent copper wire over which I pass the spiral shield thus forming a shoulder to prevent it from slipping too far into the gold tube, and providing a means of pushing the latter off of the applicator. The syringe that I furnish the patient, Fig. III, consists of a small rubber bulb holding two to four drachms fitted with a hard rubber tube three and one-half mm. in diameter and seven to eight cm. long. This was made of

an antitoxin bulb, the vent of which had been closed, and a tube taken from an old atomizer. A Eustachian catheter might be bent for this purpose.

Beamon Douglass in the *Laryngoscope* for May, 1904, p. 346, gave five objections to intra-nasal operations for opening the frontal sinuses.

1st. Absence of the frontal sinus.

2nd. Thinness of the posterior (or upper) wall of the sinus.

3rd. Liability of entering an enlarged ethmoid cell instead of the frontal sinus.

4th. Variation in direction of naso-frontal duct.

5th. Danger of opening into the olfactory fissure and injuring the nasal artery and nerve, and of opening a direct line of communication with the brain, with the possibility of injuring the brain, or of septic meningitis.

The first and fourth of these objections have no bearing on the operation that I propose.

Regarding the second—because of the protrusion of the end of the pilot, it is impossible to perforate the posterior wall of the sinus in this operation, excepting by a lateral grinding action of the burr in an extremely narrow sinus, where the dural surface of this wall would be less than three mm. distant from the center of the naso-frontal duct—a condition that if ever present, would be extremely rare. If such a condition were met with, I do not think the dura could be cut by the burr.

Regarding the third objection. If an ethmoid cell is suppurating, it should be drained, therefore no harm would be done by this operation.

Fifth. As to the danger from the olfactory fissure—the objection urged applies with even greater force to external operations that establish a drainage canal large enough to be permanent. Furthermore, injury of either the artery or nerve would be of no serious moment. The danger of infection must be met in any case and should be minimized in every possible way, but this danger is no greater with this than with other operations.

In conclusion, the advantages presented by this operation in suitable cases as they appear to me are:

1st. It causes no scar, it affords efficient drainage and it enables the patient himself easily to cleanse the sinus.

2nd. It is much safer than other intranasal methods.

3rd. It can be done early before permanent pathologic

changes have taken place and in such cases it may be expected to effect a cure.

4th. The early establishment of free drainage usually prevents serious pathologic changes.

5th. It is no bar to a later external operation if that should become necessary; indeed, it takes the place of a part of that operation as it removes all mucous membrane from the naso-frontal duct, a measure so strongly urged by Coakley, and as it will open any projecting ethmoid cells and establish a free drain, it will render the radical operation much less formidable.

6th. It will cure a large percentage of chronic cases.

I have done the operation several times with good results, two chronic cases, each of about 10 years duration, were cured, and in no case has anything unfavorable occurred; therefore, I can heartily recommend it in practically all cases of supuration of the frontal sinus in which a probe can be passed from the naris into this cavity. If the disease occurred in a sister, a wife or a daughter few of us would hesitate as to what operation should be first tried."

DISCUSSION ON SYMPOSIUM: DISEASES OF THE ACCESSORY SINUSES.

Dr. H. P. Mosher, of Boston, in connection with this symposium upon diseases of the accessory sinuses, showed two cases of frontal sinus disease that had been operated upon by the Coakley method. In one the operation had been done two weeks ago; in the other four weeks ago. The cases were shown to illustrate the simple nature of the operation, and the appearance of the wound in the course of healing.

Dr. George L. Richards, of Fall River, Mass., showed three cases of double frontal sinus disease, and one of unilateral frontal disease treated by the obliteration method, with excellent results. The openings into the sinuses had been made under the ridge at the internal angle of the eye, and then enlarged, so that all the sinus area could be reached by the curette. He also exhibited a number of anatomic specimens showing abnormal conditions of the accessory sinuses. Owing to the comparative frequency of these peculiar anatomic conformations, Dr. Richards said it could not be expected that one operation would fit all cases. In some of the specimens shown the conditions were such that complete obliteration of all the cells was practically impossible.

A complete cure in a certain number of cases of sinus disease, the speaker said, was scarcely to be expected. When the disease had lasted for years, how was it possible to get out every cell? The majority of these patients were perfectly satisfied if they could get rid of the pain and most of the discharge, with the restoration of good, normal breathing, and without the recurrence of polypi. If so much could be done for them, they would be perfectly willing to report for treatment occasionally.

Many cases of chronic frontal sinus disease, Dr. Richards said, would get well if free drainage could be secured. The statement made by Dr. Coakley some years ago that the long continuance of the discharge prior to operation had no relation to the question of how quickly a cure could be effected was often well illustrated in natural disease.

The question of deformity resulting from operation for frontal sinusitis was not to be disregarded. As a rule, American patients, especially women, preferred the operation he had demonstrated rather than the extremely radical one of Killian, or even that of Coakley.

Dr. Joseph Payson Clark, of Boston, said the subject of sinusitis and its treatment was such a large one, and had been so thoroughly covered in the papers presented, that he would limit himself to one or two points. He appreciated, as much as anyone, the success that had attended the work of Dr. Coakley, and the unusually large experience which he had had in frontal sinus surgery, but the fact should not be lost sight of that in a very large proportion of cases there was a resulting deformity from such radical operations, and that many patients refused to submit to them if they could be relieved from pain in any other way, even with a prospect of the possible continuance of a slight nasal discharge.

When fifty per cent or more of frontal sinus cases had been cured when treated by the so-called Ogston-Luc method, he considered it too radical a step to take to abandon that operation entirely. It seemed to him that efforts to improve its technique would be profitable. He urged that each case be most carefully studied, and the most conservative treatment adopted which seemed applicable to the case in question.

Dr. James E. Logan, of Kansas City, said that this question of diseases of the accessory sinuses was a most important one, and could not be too fully discussed. There were a few points that he wished to emphasize, and one was, that conservatism should be practiced in dealing with cases of frontal sinus involvement. In most instances, the disease was not confined to the frontal sinuses, and we should not be too aggressive in dealing with this condition. The speaker said he agreed with Dr. Richards that the possible resulting deformity from a radical operation should not be overlooked. The important element in the cure was the establishment of free drainage, and this was apparently secured by the intranasal method described by Dr. Inga's. In suitable cases and in their selection the X-Rays would prove of valuable assistance, an intranasal operation should always be considered before advising the more radical external method.

Dr. H. W. Loeb, of St. Louis, said that in view of the exhaustive character of the papers that had been presented, it

was very difficult for any one to do more than generalize on the subject under discussion. It was evident, from what had been said, that each man was able to do his particular operation with a great deal of skill, which showed the value of the personal equation in this as well as in other fields of medicine and surgery. For example, one man was able to get better results by employing a method that he had thoroughly mastered than he would obtain with a perhaps superior method that he did not understand so well. This same factor of the personal skill and proficiency of the operator was of importance in connection with the resulting deformity. Some were strongly in favor of conservative measures, and certainly, if we were able to dispense with the radical operation, and to substitute instead the method suggested by Dr. Ingals, it would be well to advocate it.

The papers composing the symposium on this subject had at least emphasized the fact that these operations could be done, and done well, in various ways by different operators.

Dr. Lee M. Hurd, of New York, said he had done conservative work in fifteen cases of frontal sinus disease, and had secured perfect drainage. He had simply entered the frontal sinus through the nose, enlarging the frontal duct in an anterior direction. The bone was sacrificed with forceps or other instrument, making the openings into the sinus as large as possible, and then injecting the sinus, once weekly, with a from five to twenty per cent. nitrate of silver solution. If the patient tolerated this, a saturated solution of silver nitrate was then used. At the same time, he used salt solution in the nose to counteract the effects of the silver solution there. Of the fifteen cases, he secured an absolute cure in six, and improvement in all of the rest, all the symptoms, excepting a diminished purulent discharge, disappearing.

The speaker said he had also operated upon six cases of antral, ethmoidal and sphenoidal disease. The first one, of over a year's standing, was absolutely well without any crusting whatever; of the remaining five, all were well, but there remained some tendency to crusting. He believed this would disappear in time. One of the cases had frontal sinusitis, and made a prompt recovery in spite of the pus running down over the antral wound..

Dr. Thomas J. Harris, of New York, said the papers making up this symposium deserved the highest commendation; the

members should not fail to recognize how much time and labor had been spent in their preparation, and personally he wished to express his appreciation of their value.

The speaker said he would confine his remarks chiefly to the subject of frontal sinusitis and its conservative treatment, as suggested by Drs. Clark and Logan. We should consider, first of all, the necessity of radical work in this region. Was it necessary, in the majority of cases, to do either a radical intra or extranasal operation? Leaving out of consideration the urgent cases, to which Dr. Coakley had referred in his paper, was it not true that the majority of our patients would be satisfied with what could be done for them by the usual methods that were employed, namely, the removal of the anterior end of the middle turbinate, and the clearing out of other obstructions? In the large majority of cases, this comparatively simple treatment would prove of immense satisfaction to the patient, and if, after this had been done, there was still a certain amount of muco-purulent discharge now and then, would we be justified in sacrificing the anterior frontal wall? The speaker said he did not think so. It should not be forgotten that the radical operation was not unattended with risk to life. Dr. Logan Turner had collected twenty-four fatal results following operations on the frontal sinus. Another factor to be borne in mind was the resulting deformity.

The most important feature in any method of operation on the frontal sinus was to secure free drainage, and as Dr. Loeb had stated, the personal equation was everything. The speaker said that while it would ill become him to criticise or even allude to Dr. Coakley's very extensive work in this field, he still thought there was room for an operation that would give rise to less deformity. He favored Dr. Richards' method, so far as the lack of deformity it entailed was concerned, but it left the question of a complete cure open to doubt, and the same was true of the Ogston-Luc operation. In the cases that he had operated on with Dr. Coffin, the speaker said that recently they had followed the Killian method. He considered the preservation of the ridge as a very essential point in avoiding the deformity that was otherwise so apt to occur.

Dr. H. P. Mosher, of Boston, said that the more he studied the anatomy of the frontal sinuses in the dissecting-room, the more he felt like getting a view into the sinus in the cases which he met clinically. None of the speakers had said anything

about opening the sinus for exploratory purposes. This was very simple, and left no scar. In the future, it ought to become a customary procedure, because the operator at once saw what the condition of the sinus was, and could do little or much for its relief, as the case might require.

The method of reaching the sinus through the nose was the oldest method of all that had been devised for treating the sinus. Men were continually coming back to it, but it was poor anatomy to use this route, and therefore poor surgery. The method described by Dr. Ingals, while it excluded the danger of injuring the posterior wall of the sinus, did not exclude the danger of injury to the posterior internal angle, the dangerous area of the sinus. In that angle the cribriform plate often sent forward a prolongation, and into that region, the bony canal of the foramen caecum, the vein which begins the great superior longitudinal sinus at times extends.

After comparing the scars left by the frontal sinus operation, the speaker thought there was less deformity in the cases that had been shown, where the sinus was entered above the orbital rim.

In connection with the method of opening the sinus at the upper internal angle of the orbit, the speaker said he wished to emphasize the point that whenever the operator used this route, he interfered with the pulley of the superior oblique muscle of the eye. In a large series of cases done in this way, a certain number would have permanent trouble from interference with the muscular balance.

Dr. Coakley said that he did not shave the eyebrow in his cases, because the hairs usually came out coarse, and did not match those of the opposite side. Dr. Mosher thought it was more surgical to shave the eyebrow before operating, and in order to cover the objection raised by Dr. Coakley, both sides might be shaved.

Dr. Lewis A. Coffin, of New York, said he thought Dr. Richards struck the key-note when he said that one operation could not be expected to fit all cases. There were certain cases of frontal sinus disease in which the open method of treatment was undoubtedly indicated; there were others in which it should not be done. The speaker said he was certain that Dr. Coakley was willing and found it necessary at times to get away from any stereotyped method of operation.

In regard to skiagraphy, Dr. Coffin said it was a very beauti-

ful and instructive method of demonstrating the size of the sinuses and their relation to one another, but he doubted the statement made by one of the speakers that it showed diseased conditions of the sinuses. He did not believe that the X-Rays demonstrated the diseased sinuses in any way, shape or manner. In taking these skiagraphs, the light had to pass through various layers of bony and soft tissues, as well as the brain and the air cavities, and it would be expecting a great deal of the rays to have them demonstrate the presence of pus or diseased membrane in the accessory sinuses. The fact should not be lost sight of that skiagraphic pictures of the object were not constant quantities, even by the use of the same tube, and, as far as possible, under the same conditions.

In regard to the various operations for frontal sinus disease, Dr. Coffin said that much depended upon the size and condition of the sinus. In dealing with a very large sinus, with many septa, it would naturally take a long time to obliterate it by the open method; in fact, too long. He regarded the Killian method as practically certain, and one that gave perfect results for the large sinuses.

The degree of scarring after the external operation on the frontal sinus by the open method depended much on where the wound was kept open for packing, because there was sure to be more or less retraction at that point. He advised against splitting the eyebrow, as that would frequently leave a disfiguring scar. The incision, preferably, should be made along either edge of the brow.

Dr. Coffin, in differing with Dr. Coakley, said he had seen cases in which there was undoubted independent disease of the frontal sinus, none of the other sinuses being involved. He regarded Dr. Berens' operation as certainly an illustration of heroically radical work. In his paper, Dr. Berens had reported several cases as suffering from dry pharyngitis following this radical operation. This was not at all surprising, as the functional integrity of the nose had been entirely destroyed, and nothing was left the patient but a large, irregular hole.

In conclusion, Dr. Coffin said that if the surgeon, in operating on these cases, found it necessary to be radical, he should at all times be conservatively so.

Dr. C. G. Coakley, in closing, said the discussion of the papers composing this symposium had brought out many good points. In the first place, the men who had advocated the so-

called conservative treatment had done so in a very able manner. He regarded Dr. Ingals' operation as a valuable addition to the conservative or intranasal methods of reaching the frontal sinus. It certainly would seem to give better drainage than any of the other intranasal operations with which he was acquainted. One possible danger of the method was the accidental perforation of the brain, and the setting up of a septic process, as the curettage of the sinus was done blindly. Still, Dr. Coakley said he expected to give the method a trial next Fall, and hoped for as good results as Dr. Ingals had obtained.

The speaker said he was perfectly in accord with the statement made by Dr. Richards that one operation could not be expected to fit all cases. The operation should be varied according to the indications met with; according to what the skiagraph showed, according to the size and shape of the sinus, and its condition. Dr. Loeb struck the key-note when he called attention to the value of the personal equation, which certainly had a great deal to do with it. Dr. Coakley said the reason he had not done the Killian operation was that he was not familiar with it, and the results he had obtained from his own method were so good that he had not been tempted to try any other. If the Killian operation gave better results, with less deformity, the speaker said he would be willing to substitute it for his own in suitable cases. He would gladly concede the superiority of that method when he became convinced of it.

Dr. Coakley said that in his paper he had touched upon the question of an exploratory operation on the frontal sinus, and in certain instances he thought that that was a perfectly justifiable procedure. He could recall cases where he entered the frontal sinus, and finding that a radical operation was uncalled for, he had simply closed the wound, which healed with practically no resulting deformity.

The value of skiagraphy should not be overlooked in dealing with these cases. If Dr. Haskin had resorted to it in the case he reported, the source of the trouble would probably have readily been discovered. The speaker said he had found the X-Rays very valuable in dealing with abscesses caused by aberrant teeth. In dealing with disease of the sinuses, skiagraphy did not always show the presence of disease, but a good negative always showed a marked difference between a normal and diseased sinus.

Dr. Coakley said that while the method demonstrated by Dr. Richards caused less deformity than his own if the sinus was small, it was difficult, he thought, by the former method, to gain access to all the recesses of the sinus. In some cases the sinuses were narrow, or we had to deal with multiple septa, and in such instances it would be very difficult, with any currette with which he was acquainted, to get out all the mucous membrane, and unless that was done, the mucous secretion would continue, and obliteration of the sinus would not occur. The only bleeding that occurred in the course of the operation was from the mucous membrane in the sinus, and after that was removed, together with the granulation tissue, the field was absolutely dry.

In connection with his paper, Dr. Coakley showed two patients upon whom he had operated by the method described.

Dr. T. Passmore Berens, of New York, in closing, said that in the discussion of the papers on this subject, Dr. Clark had criticised the radical operation from the standpoint that these cases could frequently be cured by less radical measures. Dr. Berens said that in his own paper he had emphasized the point that he only resorted to the radical operation in cases where milder methods had failed. In his case of pan-sinusitis referred to by Dr. Coffin, the patient had previously been under the care of two eminent rhinologists, who had failed to give him relief. The case was a very severe one, the constitutional symptoms being such that a meningitis was suspected. The local conditions were such that an intranasal operation for the relief of the sphenoidal and ethmoidal disease was out of the question. One of the rhinologists who had previously seen the patient concurred as to the necessity of an operation, and was highly pleased with the result obtained.

Dr. Berens said it was only in those cases of chronic suppurative disease where palliative measures had failed that we were justified in resorting to a radical operation, whether the disease involved the ear or the accessory sinuses of the head. In dealing with these cases of disease of the accessory sinuses, in order to effect a cure, none of the involved cells should be overlooked, and drainage should be made complete.

In reply to Dr. Coffin, Dr. Berens said he thought the nose was still a useful organ, even when "turned into one of those great, big ragged holes." In the operation he had described, the inferior turbinate and the entire mucous membrane of the

septum were always left intact, so that there still remained a large area of healthy, secreting mucous membrane. Any one could readily convince himself of that fact by seeing one of these patients undergoing an attack of coryza, which was good evidence that the operation did not destroy the function of the nose entirely.

Dr. Berens said he would be pleased to see the operation described by Dr. Ingals, but he was strongly opposed to injecting even a weak solution of commercial hydrogen dioxide through a canula into the frontal sinus. In some cases in which that cavity was affected, the disease extended to the dura, and such an injection would be very apt to set up an infection of the meninges.

XXXIII.

ADDRESS OF THE PRESIDENT.*

BY

FREDERIC C. COBB, M. D.

BOSTON.

Gentlemen of the American Laryngological, Rhinological and Otological Society, we welcome you to Boston at the eleventh annual meeting of the society. To express to you all the gratification which I feel at the honor you have done me in electing me your president is impossible. It will give me greater pleasure if this meeting shall prove as successful as its predecessors, both in its scientific and social aspects. An ideal medical meeting should be, in my opinion, an interchange of views, honest and sincere even if divergent and opposed, as a trial is made up of every possible presentation of a case. The society, as a well educated jury, must decide upon the merits of the pleas presented by the readers. Above all, truth and light are what we seek. Let us do so with open minds, unprejudiced and willing to yield our most cherished beliefs if evidence can be produced to show that we are wrong. Does this plea appear to you unnecessary? Remember the storm of vituperation which followed Jenner's glorious discovery of vaccination. Remember the disbelief which in very recent years Klebs-Loeffler's bacillus, and later antitoxin, had to undergo. We must demand proof, and clear scientific proof, and not assertion merely; but if we receive it let us accept it gladly, willingly and enthusiastically.

How numerous have been the operations devised upon the nasal septum, and how many of their originators will say frankly in a medical meeting to-day that their methods have since been improved upon? And yet in our hearts what respect have we for him whom adheres to old operations only because he has devised them!

May our papers be careful and thorough and our discussions fearless and unprejudiced, with the one object in view of attaining the truth, irrespective of personal motive or inter-

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est. So shall we not only maintain the high standard of this society, so dear to us because we have reared it from its cradle and watched its growth with delight and pride—but also raise it to such eminence that any man shall be able to point to its transactions as the wisest, fairest and most progressive work in the specialty it represents.

The foundation of this society and its phenomenal success rest upon this one principle, to be fair to all and to give to every worthy specialist the opportunity to demonstrate his power publicly, to meet others and to exchange his best for theirs. This is the essence of true democracy, and it can only be a failure when self-seeking and demagogism take the place of public spirit and a desire for truth.

Men in older associations are sometimes surprised at the enthusiastic devotion shown to this society by its members. The reason may perhaps be found in the fact that membership in the older associations is rather a reward for long, successful service in the specialty, than a helping hand when it is most needed. When we have climbed to the top we enjoy the appreciation of others. But we never can forget the hand that helped us while we were climbing and the encouragement that cheered the dreary path.

No one who will study the earlier transactions and compare them with the present, can fail to be proud of our progress, not only in the kind and variety of subjects treated, but in the scientific research and accuracy of observation shown. The section meetings have been eminently successful and have demonstrated the wisdom of continuing them. To my mind, nothing shows our progress so much as do these section meetings. A few years ago we should have been justly proud to have had such programmes at our annual meetings as we now have at the sections. During the past year the activity of our members has not decreased. It is impossible in the space allotted to do more than allude to the excellent work of Coakley, Luc, Freudenthal, Turner, Coffin, Kyle and Mosher on the frontal sinus, and of Richards, Stucky, Berens on the general subject of sinus diseases; while we find intra-nasal surgery and deformities of the nose represented by Richardson, Gibb, Mosher and Berens; papers on the pharyngeal lesions by Myles, Packard, Cline, Ingals, Leland and Hopkins, and neuroses by Hudson McCuen. These contributions and many others in the transactions of our sections may serve to give an idea of the activity of members of this organization.

And now, gentlemen, it is my pleasant duty to welcome you to Boston in the name of your Boston fellows and in my own. We have tasted the hospitality of the South in Kentucky, and of the West in Chicago and Cincinnati. Washington has shown us her wonders, New York her wealth and luxury, and Pittsburg her industries. Boston can show you monuments of the past which have been a large factor in making this great country what it is—a university which founded among the first in the land, has always stood and stands today for the best of all knowledge and progress in America, and a Medical School, recently endowed with magnificent buildings and equipment, which will, we hope, enable us to do better work in medicine and surgery than has hitherto been possible anywhere. To those interested in hospitals, the Massachusetts General, the Eye and Ear Infirmary and the City Hospital will appeal as having the newest ideas in construction and in management.

The contagious department of the City Hospital, which is under the management of Dr. McCollom, is a model in antiseptic construction, and has, we believe, the best possible appliances for the treatment of contagious diseases.

The new out-patient department of the Massachusetts General is solving one of the great problems in out-patient work, which has been to so regulate records that they shall be of value as statistics and yet shall not fall into the hands of the patient, to be conned over and reported in a garbled form elsewhere. As the patient arrives, his record on a large card is sent to the department to which he is accredited by the admitting physician. On reaching this department the patient is brought to the physician in charge and the card bearing his name has entered upon it the diagnosis and treatment required. The patient is then dismissed and his card is sent down to the out-patient office, where it is indexed both under the head of name and of diagnosis. In this way the patient himself does not see the entries made as to his symptoms or disease, while the physician is enabled to refer to the office for reports of classes of disease, or for names of patients which he requires. Should the patient be transferred for opinion or for treatment to another department, his card is so marked and a page carrying it conducts the patient to the designated specialty. Thus every card records all opinions delivered by the authorities of each department the patient may visit, and a large library of clinical cases is rapidly being accumulated.

It may not be amiss to allude in a few words to the teaching of laryngology at present in use in the Harvard Medical School, since most of us are interested in this class of work. Laryngology is taught in the third and fourth years of the course, lectures being given once a week during the latter half of the third and first half of the fourth year. The whole number of students is divided into sections and clinically instructed in the use of instruments, technique and diagnosis at the various hospitals, under different instructors, each student getting about twelve exercises. The study of anatomy of the sinuses, of the nose and throat has been introduced and is taught by one of our members. It seems to me that the study of anatomy of this specialty by the students marks a distinct advance.

In the new out-patient department already alluded to, a room is set apart for anatomical and pathological specimens of nose and throat diseases. The study of sinuses and newer methods of examining the trachea and esophagus have greatly broadened our specialty, so that the time given to the study of laryngology seems ridiculously small. The student is most carefully instructed in the more important surgical operations, which without years of study and practice he can never attempt, and which naturally he will seldom see. The whole number of hours given to surgery is about 583, to laryngology and otology 135. Does the general practitioner see over three times as much surgery as he does of nose, throat and ear diseases, and, more important still, does he do three times as much of it?

Time forbids, gentlemen, that we should go more fully into this subject. We have a long and interesting programme before us, and I declare the 11th annual meeting of the society open for the transaction of business.

XXXIV.

OBSERVATIONS IN TWO HUNDRED CASES OF MASTOID DISEASE WITH OPERATIONS.

BY

FRANK B. SPRAGUE, M. D.

PROVIDENCE, R. I.

SURGEON TO THE EAR, NOSE AND THROAT DEPARTMENT OF THE
RHODE ISLAND HOSPITAL.

This paper is simply a testimony of personal experience in the operative treatment of mastoid disease and its complications as occurring in the run of practice, hospital and private, emphasizing important symptoms and indications for operation, showing the method of operation, the method of closing the wound to get the quickest healing, as by "modified blood-clot" and other methods.

Of these two hundred cases, one hundred and fifty-eight were acute, and forty-two were chronic. The duration of illness in the acute cases varied from one to six weeks, the majority being between two and three weeks; the chronic cases from four to twenty-five years. The causes of the inflammation in the acute cases were scarlet fever, six cases; measles, two cases; typhoid fever, one case; the remaining one hundred and forty-nine cases were grip or some form of influenza, and occasionally tonsilitis. Other unusual causes were: a skull fracture extending through the temporal bone which became infected, involving the styloid foramen and facial nerve; another, tubercular glands of the neck which broke down and eroded the mastoid cortex causing necrosis of the bone and cell structure; another, adeno-carcinoma involving the cartilaginous meatus and the squamous and mastoid portions of the temporal bone; another case occurred in a diabetic patient, but I cannot say that diabetes was the cause. In this case healing was slow but recovery from the mastoid and ear conditions was complete in fifty days.

SYMPTOMS.

It is not my intention in this article to go into the symptomatology of this disease, but simply to call attention to the more important or positive indications for operation.

The cases with typical symptoms, namely, pphlegmonous swelling over the mastoid region, were operated on without preliminary treatment as soon as arrangements for operation could be made. Cases with only slight edema over the mastoid region were treated for palliative means as ice, dry heat or leaches and irrigation for from four to six days or longer, if the patient's condition seemed improved. If there was no improvement, however, in three or four days and the positive indications for operation were present, then operation was performed. Naturally I am guided to a decision by indications commonly known to otologists. We cannot wait for typical symptoms as traditionally given, as in the majority of cases these symptoms are absent when the case presents itself.

Among the subjective symptoms, the principal one was pain, just after midnight, generally between twelve and two A. M. The patient would seem fairly comfortable during the other twenty or twenty-two hours of the day, and sometimes children would appear very well, even playing about the room during the day so that the parents could not see any need of operation, believing the child to be improving. But for two or three hours at midnight it would arouse the household with its cries, from pain in the ear and side of the head, which would subside by two or three o'clock, until the next night. This symptom has been to me the principal indication for operation in many cases.

TENDERNES.

Tenderness on pressure over the mastoid region is also of great importance and is nearly always present at one or more of three points, namely, over the tip, over the posterior meatal fossa, and deep in, just behind the tip, over the openings of the emissary veins. When tenderness is persistently present, operation is advisable, although its absence does not contraindicate operation, as I have operated several cases where there was no tenderness at either point mentioned and found pus.

TEMPERATURE.

Temperature is not much of a guide except in septic conditions of the system, and in sinus or intracranial involvement where it is invaluable and should be taken and recorded every three or four hours.

PROFUSE PURULENT DISCHARGE.

A profuse discharge of pus from the ear, where the canal is refilled within an hour or two after irrigation, in a case where otitis is continued for ten days or more, to me is an objective symptom of great importance. I say ten days because we have all seen many cases of acute suppurative otitis media where the discharge has been profuse and yet the patient recovered without mastoid involvement.

THE MEMBRANA NIPPLE.

The nipple-like protrusion of the upper posterior quadrant of the drum head is indication of a violent inflammation of the antrum, and is in the majority of cases an indication of mastoid involvement. I have seen three cases, however, where this symptom was prominent and other indications were present and the operation advised and refused and the patient recovered, after several weeks, from the inflammatory symptoms, but there was a loss of from fifty to seventy-five per cent of the hearing in the affected ear in each case. This suggests the advisability of operation in these cases, if for no other reason than to preserve the hearing. for in the cases operated upon the hearing is nearly normal, often quite so.

SAGGING OF THE CANAL WALL.

The sinking in of the upper posterior wall of the bony meatus at its inner end, that is, flattening out of the curve of the canal at this point, is nearly always present after the first week of inflammation, and sometimes earlier. This is a positive indication for operation.

BLOOD EXAMINATION.

The clinical examination of the blood is a helpful aid to diagnosis, and as a matter of routine should be practiced in every case. When the white count is from sixteen thousand to twenty thousand or above, we are led to believe there is

pent up pus somewhere, and in the presence of other mastoid symptoms we feel justified in operating. This is especially useful in the intracranial complications. In a recent case of brain abscess which appeared to be progressing favorably as far as temperature, pulse and general condition of the patient would indicate—in fact he was sitting up in bed, playing with his toys and said he felt all right—the white count, which was taken every three or four days and had been running about 12,000, was found to be 28,000; the dressing was soon done and the wound opened with a probe and about half an ounce of pus escaped from the brain. Had it not been for the blood examination, serious trouble might have resulted before the reaccumulation of pus was evident. A polynuclear count of eighty per cent or over gives evidence of septic infection.

LUMBAR PUNCTURE.

Lumbar puncture was practised in two serous meningitis cases giving immediate relief to the brain pressure symptoms; and I think in other cases, that appear to be serous meningitis, I should defer craniotomy until I had seen the results of the lumbar puncture, for the relief is immediate to cerebral pressure and brain symptoms. How lasting or how curative it may be is yet to be determined. Great care should be used in craniotomy in serous meningitis cases as injury of the brain substance might result in necrosis from infection from infected cerebro-spinal fluid.

BACTERIOLOGIC EXAMINATION.

Bacteriologic examination of the discharge from the canal is of some value, although I should not feel like operating simply from finding streptococcus in an acute otitis without other positive indications. For I have found frequently pure positive indications. For I have found frequently pure culture of streptococcus in acute ears which have resolved without mastoid complications.

THROMBOSIS OF THE LATERAL SINUS.

In the cases complicated with thrombosis of the lateral sinus the peculiar zigzag temperature curve, oscillating up and down from 99 degrees or lower to 104 or higher has always been present, in one case reaching 106.5 degrees. In one case, however, a messenger boy came into the clinic one morning right

from his work simply on account of ear ache and was referred to the house and operated on in the afternoon, when the mastoid was found necrotic with a perforation into the sinus which contained a clot one and a half inches long with free pus in the centre. Pain in the head on the affected side was present in every case as was also chills, except in the case just mentioned. Nausea and vomiting were prominent symptoms in some cases. Optic neuritis in both eyes was present in one case, the cord-like swellings of the neck were not in evidence. Swelling over the tip extending downward was present in one case, the other cases had no external evidence.

SINUS PHLEBITIS.

This condition was present in four cases all of which showed a similar temperature curve as is common in thrombosis, but not as long oscillations. The systemic condition seemed of greater gravity than the finding at operation would warrant; but the relief was so immediate and complete that there seemed no question as to diagnosis. *Streptococcus* was found in the cultures.

BRAIN ABSCESS.

These cases seemed to hold their reputation for obscurity of evidence. In two cases I was not suspicious of brain abscess before operation. The patients had both been attending their daily occupations regularly and consulted me on account of pain in the ear and headache, nothing unusual for otitis, and at operation a tract was found leading to the abscess directly over the mastoid roof, as large as a walnut in each case. In other cases, headache, irritability of temper, wanting to be let alone, emaciation, vomiting, peculiar temperature and pulse were among the prominent symptoms.

CEREBELLAR ABSCESS.

In the one case of this complication there were marked symptoms of brain pressure, convulsions, vomiting, hemiplegia and hyperesthesia of the affected side, this being on the opposite side from the abscess, divergent strabismus, euphoria, dialation of both pupils, optic neuritis and coma which lasted thirty-six hours after the operation, after which there was gradual improvement and complete recovery.

FACIAL PARALYSIS.

This condition was present in nine cases before operation. Seven recovered completely after operation, one case was temporarily made worse by operation but recovered in about five weeks to as good a condition as before. Good fortune was with me in not having in the whole series any facial paralysis subsequent to operation which could be attributed to injury of the nerve.

PREPARATION FOR OPERATION.

For five or six hours, if possible, before the operation a biclorid of mercury poultice is applied to the side to be operated upon. The head is shaved for two or three inches around the auricle; in women this extensive shaving is not done, but simply the clear skin just back of the auricle is shaved, not disturbing the hairline, for I find I get along with the patient much better during the succeeding weeks, and I do not see but that the results are just as good as when a large area is shaved; in men and children the region of operation is shaved as a matter of convenience. After the biclorid poultice is removed at the time of the operation, the hair is soaked with ninety-five per cent alcohol and covered with a rubber cap and towel wet with biclorid. In all cases the field is thoroughly scrubbed with ninety-five per cent alcohol after the removal of the poultice. The canal is then thoroughly cleansed by irrigation with saline solution followed by alcohol, and the first step in every operation in acute or sub-acute cases is to make incision through the drum head from top to bottom in the posterior half no matter how many perforations may have been made before. If a good opening exists, it may be enlarged to the limit. This is very important for drainage after the operation. It is naturally presupposed that the operator, assistants, nurses and all instruments and dressing are thoroughly sterilized and the general principles of operative aseptic surgery observed to the letter. The usual incision following the curve of the auricle one-fourth of an inch behind its insertion is made, or as near this as can be judged where phlegmonous swelling is present. The curve, however, is not followed at the lower part as a straight down cut when the tip is reached affords, I think, better access to the cavity for cleansing during and after treatment. In a general way the typical operation as devised by

Professor Herman Schwartz is done with modifications to suit each case. Gouges and curettes are the instruments used to remove necrotic tissue. Gouges similar to Schwartz's and curettes after the pattern of Blake suit me the best. The only rule I have for operating is to remove all necrotic tissue much or little. If this is not done thoroughly, quick healing and protection of the patient against infection cannot be assured. I have rarely found it necessary to remove all of the outer cortex; I aim to save as much of the healthy bone as possible to form a support for the surface in healing. This leaves less depression and in most cases there is none left after healing is complete. The opening in the cortex in adult cases is usually from three-eighths to a half inch in width and extends from the suprameatal spine to the lowest level of the tip. This affords complete drainage. Naturally, in extended necrosis, it is not always possible or even wise to save much of the cortex, but in my experience these cases are in the minority. In most cases, after the cells and all necrotic bone are removed, the cavity is irrigated with saline solution. Some cases, however, are not irrigated at all but simply mopped out with sterilized gauze. It seems to me that the drier the wound can be kept the more rapid will be the healing process. But of course, in extensive empyema and necrosis it is necessary to irrigate.

A word regarding commonly called antiseptic solutions. For the purpose of cleansing the ear or mastoid wounds, much has been said and written about using solutions of biclorid of mercury in the strength of one to ten thousand to sterilize the canal or make the wounds aseptic. Now laboratory experiments have shown that it requires at least one hour to kill staphylococcus of different varieties in a test tube culture where the colonies are submerged in a one to five thousand biclorid of mercury solution. To kill the streptococcus takes nearly as long. Now it seems to me that, if it requires an hour to destroy these micro-organisms when submerged in a one to five thousand solution of biclorid of mercury, the simple exposure that would result in the two or three minutes irrigation of the infected parts would hardly be enough to destroy the micro-organisms. And biclorid in stronger solutions than one to five thousand is an irritant to the delicate tissues of the canal, frequently causing eczema and other uncomfortable irritations in the ear beside the danger in children of these stronger

solutions reaching the throat through the Eustachian tube. It seems to me that irrigation with the milder solutions as saline solution or bicarbonate of soda solution which will thoroughly cleanse the canal and remove the sticky mucus and epithelium is safe, effectual and more desirable. I think our prevention of infection is due to removing the pus as often as possible and keeping the infectious organisms away from the parts as well as it is possible to do rather than by any antiseptic irrigation. Where there is profuse discharge from the wound I have it dressed twice a day. When a large amount of necrosis is present either in the soft parts or in the bone, I find swabbing of these areas with ninety-five per cent of carbolic acid followed by ninety-five per cent of alcohol a very successful way of sterilizing the cavity after the tissues have been removed.

The form of operation has been as follows: Schwartze typical in one hundred and fifty-eight cases; semi-radical, four cases; radical, thirty-eight cases. Five of the typical cases were bilateral; and two of the radical cases were bilateral; two of the semi-radical cases were made radical, one fourteen months, and one four and a half years later by subsequent operation. And seven of the typical cases needed a second operation on account of extended necrosis; four of them three months later, one of them four months later, one three weeks later, and one four weeks later.

CONDITION FOUND AT OPERATION.

Typical symptoms as edema, swelling and redness were found in eighty-five cases, the soft parts varying in thickness from one-fourth of an inch to one and a half inches. The supra-meatal spine was present in most of the adult and all adolescent cases. The thickest cortex was one-half inch, from that all grades of thickness down to a perforation. The location of the sigmoid groove was generally from three-fourth to one inch behind the canal; one case was an eighth of an inch, one one-fourth of an inch, and one three-eighths of an inch behind the canal. The cells in most of these cases were necrotic, softened, containing fluid or cheesy pus and pyogenic granulation tissue. Either pus or serum containing streptococcus, which would soon have become pus, was found in the cells in every case so that I do not feel that any case was opened unnecessarily.

There were three cases which might be called Bezold cases.

Only one, however, of these had a spontaneous perforation of the medial side of the tip. Gravity abscess of the neck was present in three cases extending from two to three inches below the tip under the sterno-cleido-mastoid muscle. Necrosis was due in one case to tubercular glands of the neck. In five cases, pus was found burrowing under the tissues of the scalp in varying degrees extending from two inches from the meatus, in some cases, to the outer angle of the orbit, and almost the medial line of the vertex in others. Sequestrum of the external auditory canal was found in three cases; malignant growth of the mastoid and the squamous portion, one case; thrombosis of the lateral sinus, eight cases. Six of these recovered without ligation; one died of pyemia with metastatic abscess, eighteen days after operation. Another died of lepto-meningitis fourteen days after operation. In these two cases the system was so widely infected at the time of operation that ligation of the internal jugular vein would have been of no use.

Sinus phlebitis was found in four cases, all of which recovered. Extradural abscess was found in four cases, one of which showed three independent abscesses, one over the root of the zygoma, one over the roof of the tympanum and the roof of the mastoid. This case was also complicated by a thrombosis of the sinus. All of these cases recovered. Serous meningitis complicated three cases, all of which died. Dementia was present in two cases, one sixty-five years of age, and one seventy-one years of age. The first one took on the form of somnambulism, three weeks of the patient's life being absolutely blank. One case had what might be called a dry necrosis. This patient never remembered having had ear ache or any distress in the ear except a slight deafness for which she consulted me, and which dated several months back. When first seen by me, only symptoms of tubotympanic catarrh were present which was readily relieved by catheterization. About a month later the patient consulted me again with swelling behind the ear which was very tender. The middle ear showed no evidence of inflammation, the drumhead and canal were practically normal. At the operation the bone structure was one mass of softened necrotic tissue intermingled with thick cheesy pus. The whole inner cortex of the mastoid was destroyed. One case of purulent meningitis was the result of trephine injury. The surgeon who first operated the case

attempting to open the mastoid with a trephine had missed the mastoid entirely and cut a button of dura and brain tissue along with the button of bone. The patient was unconscious when admitted to the hospital. One patient had both mastoids involved, and I intended to open both of them, but a large mass of adenoids and two enormous tonsils were present which obstructed the breathing and delayed the operation so that, after the operation of one mastoid and the removal of this lymphoid tissue in the throat, it did not seem best to open the other mastoid, but a large incision was made in the drumhead of the other ear which gave better drainage and depletion. This patient made a good recovery and the unoperated mastoid resolved without further trouble. Here is a case where I think that the depletion from the removal of the adenoid tissue and the establishment of better conditions in the throat saved the mastoid operation. And I think in a number of cases of acute middle ear with mastoid tenderness, a number of other mastoid complications have been prevented by the removal of the adenoids when the ear was in the acute condition. There is a possible danger of infection in undertaking such an operation while the ear is acutely inflamed, but with the Eustachian tubes tightly closed as is usual in these cases I do not think it has very great certainty; in my experience, at least, there have been no bad after effects, on the other hand it has been beneficial.

METHOD OF CLOSING THE WOUND.

I have not followed the traditional way of closing the mastoid wound, i. e. by leaving the surfaces to granulate in, as I believe that the large amount of freshly cut surface leaves too great an area for infection; certainly this method is slow in healing, requiring from six to ten weeks, and the exuberant granulation tissue which so quickly forms on the surfaces is extremely troublesome in many cases. In all of these cases the wound has been closed to a greater or less extent. In the first three cases a rubber drainage tube was inserted in the cavity and the wound closed by sutures, above and below it. This was then discarded and wicks of gauze were used instead. The wick of gauze about three-eighths of an inch in diameter was placed in the cavity and brought out at the bottom of the incision. The rest of the wound was closed by from four to six or more stitches as the case required. For the past two years I have used what is known as the cigarette drainage devised by

Dr. Halstead of Baltimore, which he calls "protective drain," which is a soft rubber tube containing a wick of gauze. This I find causes less discomfort, when the first dressing is done as the tube can be removed without the slightest pain to the patient. The dressing of gauze sponges and bandage is now applied, and if all goes well, is left for four or five days undisturbed. At the first dressing the rubber drainage is removed and the cavity is wiped out with sterilized cotton. Irrigation is not used until pus is found. Many of these cases have healed without the need of irrigation and without the formation of pus, simply a discharge of clear serum being present during the first week or ten days, after which the wound is allowed to close. The duration of healing in these cases is shown below. In the radical cases the Stacke or the Zaufal operation or some modification, was performed in most cases, in some cases with extensive necrosis the Schwartze radical was used. With the exception of the cases where necrosis was extensive, the incision behind the ear was completely closed in most cases at the time of operation by sutures, and the subsequent dressings done through the canal. The early cases were tamponned closely at the time of the operation, but the removal of these tampons caused such intense pain to the patient at the first dressing that I do not now tampon at the operation but shape the canal on a piece of rubber drainage tube after turning in the flaps and making the canal as large as the case requires. This is left in for two weeks and cleansing is carried on through this opening. At the end of two weeks the tube is removed and the cavity thoroughly cleansed and tamponned closely (not tightly), each day until epidermization is completed, which is from six to twelve weeks in most cases.

DEATHS.

Fifteen cases died, four of pyemia, three of serous meningitis, three of brain abscess and meningitis, two of purulent meningitis, one of septicemia, one of shock—a child two months old—and one of adeno-carcinoma, eight months after operation. All of these cases except the two months' old baby, died of complications well established before operation. The operation being performed merely as a chance to save life. Several of the cases were unconscious before operation. The patients who died would have died without operation and perhaps some men would not have spoiled their statistics by attempting a

case which was practically moribund when admitted to the hospital. It is interesting to note that among the older people where death might be more commonly expected, there were only two deaths, one at seventy-nine, of septicemia; and one at sixty-five, of brain abscess.

THE LENGTH OF TIME REQUIRED FOR HEALING.

Number of Days.	Patients.
10.....	1
12.....	1
13.....	4
7.....	1
14.....	20
15.....	10
16.....	2
17.....	7
18.....	18
19.....	5
20.....	4
21.....	5
22.....	3
23.....	3
24.....	5
25.....	1
26.....	6
27.....	3
28.....	5
32.....	4
33.....	3
34.....	1
35.....	1
36.....	1
37.....	1
38.....	1
39.....	1
40.....	1
41.....	2
42.....	4
46.....	1
50.....	1
51.....	1
52.....	2

Thus one hundred and four out of one hundred and fifty-eight acute cases were healed in four weeks, twenty-five of these in two weeks, and seventy-six in three weeks. The healing process was delayed in the case of diabetes, and in other cases by extensive necrosis or low vitality of the patient. In favorable cases a modified blood-clot method of healing was utilized and a large percentage of these were successful as shown by the rapid healing.

PRIVATE VS. HOSPITAL CASES.

I find that cases in private houses heal much more quickly than the average hospital case. Infection is more likely to occur in a large general hospital than in private hospitals or private houses.

The bacteriologic examination showed streptococcus in thirty-nine cases; staphylococcus albus, eight cases; staphylococcus pure, one case; staphylococcus albus and aureus, two cases; streptococcus and staphylococcus combined, four cases; diplococcus, one case; unidentified and encapsulated diplococcus, three cases; in two cases, pure culture. These latter organisms which are somewhat unusual in mastoid disease were described by Dr. Mary S. Packard in the *Journal of Medical Research*, March, 1903. I regret that more cases could not have had bacteriologic examination, but it was not possible under the circumstances.

COMPLICATIONS FOLLOWING OPERATION.

Septic arthritis in two cases (one streptococcus infection, the other unknown); both cases recovered. Streptococcus infection of the skin of the face and scalp resembling erysipelas in two cases; one of these patients, seventy-nine years old died.

THE AGES OF THE PATIENTS FOLLOW.

No. of Patients.	Age of Patients.	No. of Patients.	Age of Patients.
1.....	6 weeks 3 days.	1.....	15 months.
1.....	3 months.	1.....	16 months.
1.....	3½ months.	1.....	22 months.
1.....	4 months.	2.....	2 years.
2.....	7 months.	8.....	3 years.
1.....	9 months.	1.....	3½ years.
2.....	14 months.	1.....	3 years 9 months

No. of Patients.	Age of Patients.	No. of Patients.	Age of Patients.
1.....	4 years.	1.....	31 years.
4.....	5 years.	2.....	32 years.
8.....	6 years.	5.....	33 years.
4.....	7 years.	2.....	34 years.
3.....	8 years.	7.....	35 years.
4.....	9 years.	4.....	36 years.
3.....	10 years.	1.....	37 years.
3.....	12 years.	2.....	38 years.
1.....	13 years.	1.....	39 years.
5.....	14 years.	6.....	40 years.
4.....	15 years.	2.....	42 years.
3.....	16 years.	1.....	43 years.
3.....	17 years.	3.....	45 years.
2.....	18 years.	1.....	46 years.
5.....	19 years.	1.....	48 years.
3.....	20 years.	1.....	49 years.
1.....	21 years.	2.....	51 years.
5.....	22 years.	1.....	56 years.
4.....	23 years.	1.....	60 years.
1.....	24 years.	1.....	61 years.
7.....	25 years.	3.....	65 years.
2.....	26 years.	2.....	70 years.
3.....	27 years.	1.....	74 years.
4.....	28 years.	1.....	79 years.
6.....	30 years.		

It is of anatomical interest to know that well developed mastoid tips containing pneumatic cells are occasionally found in infants, as the above figures will show; every case, even in the youngest babe six weeks and three days old, showed mastoid cells external to the antrum.

XXXV.

TINNITUS AURIUM AND HALLUCINATIONS OF HEARING:

OR

THE RELATION OF EAR DISEASE TO AUDITORY HALLUCINATION OF THE INSANE.

BY WM. SOHIER BRYANT, A. M., M. D.,

My attention was called to this subject in the various aural clinics with which I have recently been connected, by seeing several patients who were seeking relief from imaginary voices.

Careful search in otological literature has given very bare results upon the subject, but I have found the neuro-psychological literature extensive. The search shows, moreover, that hallucinations of hearing are much more common and of greater psychological importance than other hallucinations, and that they are usually the primary hallucinations. In the order of their importance, hallucinations are classified as hallucinations of hearing, of sight, of smell, and of touch.

As early as 1531, Donat (12) described a case of auditory hallucination. Bodin (6), in 1580, in his description of unilateral hallucinations of hearing, portrayed the first indication of a possible connection between the ears and auditory hallucinations, but he did not remark the significance of this phenomenon. A similar description was given by Dom. Calmet (13), in 1751. He also failed to note the importance of the phenomenon. Almost a century later, Baillarger (1), in 1846, makes specific reference to a possible relationship between the ears and auditory hallucinations. This relationship is made more explicit by Köppe (29), in 1867.

There is considerable evidence showing the association of ear disease with auditory hallucinations (1, 2, 7, 8, 10, 26, 29, 34, 46, 49, 51, 52, 55, 59). The results given by a number of observers shows that in the majority of cases of audi-

tory hallucinations, the patients are also suffering from ear disease. In many of the hallucination cases, complaint of tinnitus is also found; in fact, very few cases of auditory hallucination are free from disturbed aural function of the kinds which are usually accompanied by tinnitus.

Unilaterality of some hallucinations of hearing suggest that they may possibly depend on a peculiarity of the ear on the affected side. On examination of the ears, defects are found on this side.

(1, 2, 4, 5, 6, 8, 9, 13, 14, 16, 18, 19, 21, 22, 25a, 31, 32, 33, 34, 35, 38, 40, 41, 42, 43, 44, 45, 46, 47, 51, 52, 53, 55, 58, 60, 61, 62, 63, 64, 65.)

Without exception, unilateral auditory hallucinations are lateralized on the same side as the constantly present ear lesions. Furthermore, in most of the cases in which tinnitus aurium is associated with the hallucinations, the dominance of the hallucinations increase with an increase of the tinnitus, and the hallucinations do not continue after the cessation of the tinnitus.

We have, therefore, good evidence that auditory hallucinations are often dependent on ear disease, and that some of the cases are due to stimulation of the auditory centers by peripheral tinnitus aurium.

The unstable condition and hypersensibility of the auditory nerve centers and cortex favor the pathological interpretation of the stimuli given by the tinnitus aurium, and hallucinations of hearing are established. The gravity of the pathological impressions depends chiefly on the degree of psychical instability. They vary from mere conscious illusions to hallucinations under the patient's control, and from hallucinations to dominant delusions.

The psychic classification of tinnitus is as follows: I. The largest class, in which the tinnitus is not heeded by the patient. II. When it is the object of mental disquiet in psychopathic patients, tinnitus causes many nervous disturbances, as hypochondria, neurasthenia, or melancholia and quasi insanity. III. In this class the tinnitus causes auditory hallucinations,—group (a) hallucinations which are of slight import and are usually conscious, (b) unconscious hallucinations, but of no great psychic importance, (c) true delusion, usually with persistent delirium which finally becomes organized.

I quote Redlich & Kaufmann's figures (49). His results

are as follows: Number of insane examined 97; number of patients without hallucinations of hearing, 10; patients with normal ears, 11; hallucinations of hearing, 58; abnormal ears, 57; tinnitus, 26 cases; doubtful cases not otherwise tabulated, 29.

I have examined 56 insane at the Manhattan State Hospital, with the following results: Without hallucinations of hearing, 5; cases with normal ears, 4; with hallucinations of hearing, 41; cases with abnormal ears, 42 (mostly non-suppurative); cases with tinnitus aurium, 27; doubtful cases, unable to answer questions, 10.

A large amount of literature shows that auditory hallucinations are caused by stimulation of the sound perceiving apparatus (3, 7, 26, 30, 34, 54). The hallucinations may arise from external sound impression, or from primary stimulation of the auditory centers (22, 23, 24, 36, 43, 45, 60).

The hallucinations usually depend for their inception on stimuli received by the auditory center. The stimuli originating peripherally pass directly along the auditory fibers, or indirectly from other centers along the association tracts. In rare cases the auditory center itself may be subject to primary stimulation, which is due to pressure or to chemical irritants.

The sound perceiving apparatus is abnormally sensitive to electric stimulation, and probably to other stimuli in patients suffering from auditory hallucinations (10, 26). This irritability is often found in the deaf also. It is probably due, as a rule, to the exhaustion which follows the painful effort to hear, when hearing is difficult (17). Probably it also follows the fatigue which results from constant noises, chiefly tinnitus. In a few cases the irritability is due to exhaustion consequent on disease of the nerve centers and brain, as for instance, tumor, etc.

Though the predisposition to the production of hallucination is found in a psychopathic condition, an exciting cause is necessary. This has been illustrated by several authors who have produced artificial hallucinations by stimulation of the auditory apparatus (7, 26, 30, 39).

Tinnitus aurium is a common accompaniment of auditory hallucination and is probably its usual exciting cause. This conclusion is sustained by the number of cases having both

tinnitus and hallucination (1, 2, 11, 20, 25, 26, 27, 29, 33, 33a, 34, 47, 49, 50, 52, 56, 57, 63, 65), and by the remarkable number of cases of ear disease associated with hallucination of hearing. These ear diseases in the physically sound would generally be associated with tinnitus. I have found that the hallucinations fluctuated, together with the tinnitus. This has been noted by others (2, 51, 56). The hallucination follows the course of the ear lesions, unilateral, bilateral, intermittent and remittent, etc. The tinnitus often alternates with the auditory hallucinations. Sometimes they may occur together, in which case they fluctuate together.

The hallucinations which are provoked by external sounds very closely resemble paracusis or after-impression tinnitus aurium (56). They may be excited by any common sound such as a clock ticking or striking, etc.

Some hallucinations of hearing are induced by irritation of the peripheral nerves about the ears, that is; by the stimulation of the trigeminal nerve. This is doubtless the same reflex sensation as tinnitus excited in the same manner. Alterations in the circulation which are known to affect tinnitus also affect hallucinations (20). The condition of the naso-pharynx which is a very important factor in determining tinnitus is also relevant to hallucination. The congested, inflamed mucous membrane in the acutely insane fades out to its normal appearance during convalescence from the hallucinations. The purulent secretion ceases as the long standing cases of hallucination improve. Trauma of the ears has also been noted as an inducing cause of hallucination (2, 15, 26, 49, 52). It is usually accompanied by tinnitus.

Ear lesions causing tinnitus are an exciting cause of hallucinations on account of the exhaustion of the sound perceiving apparatus from the constant irritation of the tinnitus.

As we might expect from some of the preceding observations, ear disease is sometimes the precursor of hallucinations (1, 2, 8, 20, 25a, 34, 48, 51, 56). The insane whom I examined had chronic ear affection, which in all the cases of recent insanity must have preceded the hallucinations of hearing.

Ear disease both renders the sound perceiving apparatus more impressionable, and also furnished the source of the impressions, namely, tinnitus; in addition, it shuts off from the mind some of the correction and occupation it might get

from external sounds which are normally heard, but which, owing to the concomitant deafness, cannot now reach the auditory centers.

Prognosis. For the above reasons the prognosis of the hallucinations is bad in proportion to the deafness.

Prognosis is good in groups I and II of the psychic classification of tinnitus, and in classes (a) and (b) of group III. It is encouraging in some of the cases of class (c) when the ear disturbance can be wholly overcome. Old age is an important factor as a bad indication in prognosis for hallucinations because of the steadily failing hearing, the concurrent tinnitus which is often due to progressive circulatory changes, and because of the steadily progressive mental deterioration (23, 28, 57).

Unilateral hallucinations do not have much psychic influence, because of their correction by the opposite side. Bilateral hallucinations with normal, or nearly normal hearing, and with remediable ear lesions have a good prognosis. When the hearing is much diminished, the prognosis is bad. For in these cases, the psychic disturbances increase progressively. Finally, the hallucinations become delusions (20).

A few cures of hallucination by ear treatment have been reported (2, 8, 34, 50). These cures were chiefly in suppurative disease of the middle ear and in trauma, besides impacted cerumen and foreign bodies in the meatus. It is difficult to find any mention of the cure of hallucinations of hearing by aural treatment in non-suppurative conditions, although such cures may have occurred.

The following cases of hallucinations are interesting because of their evident dependence on catarrhal conditions of the ears as shown by the cessation of the hallucinations when those conditions are corrected.

Case I. I saw the patient in 1904 at the Vanderbilt Clinic, where she came for relief from the distress caused by hearing voices constantly speaking to her. People she knew across the sea spoke ill of her. Their voices were very real to her. Part of the time she was able to persuade herself that the voices were only imaginary. Occasionally she had visual hallucinations with vivid auditory hallucinations, and saw her brothers who were far away in Ireland, while they upbraided her.

The patient was a psychopathic, single woman of 31, and was not a teetotaler. Her eyes had a wild, restless expression.

Her family history was negative. She was a housemaid. An examination of her ears showed a slight chronic otitis media catarrhalis, and also a slight obstruction of the Eustachian tubes. The mucous membrane of the naso-pharynx was congested. Treatment of the naso-pharynx and catheterization of the Eustachian tube stopped the hallucinations after a few times.

In the spring of 1905 the patient was seen by Dr. Michaelis. She had a mild recurrence of the auditory hallucinations. This time she complained of the men next door, who, she said, had designs on her. Again, the hallucinations soon yielded to catheterization.

Case II. The patient was a housemaid, thirty-two years old, and single. Her family history was psychopathic. I saw her at the New York Eye and Ear Infirmary in 1903. She came to the hospital for treatment and relief from auditory hallucinations which prevented her sleeping. The voices spoke chiefly about things in her mind. They said bad things about her. The voices were most annoying in a quiet place and in bed. At night she could not shake off the incubus of their reality, and would try to run away from them.

Inspection showed chronic otitis media catarrhalis of the ears, and a moderate stenosis of the Eustachian tube. She said that she had buzzing and ringing tinnitus, principally in the right ear, and that the sounds of the elevated trains remained in her head long after they had passed. She heard voices in either ear when she put it on the pillow.

Treatment was given by the catheter and the Siegle speculum and by applications of a solution of silver nitrate. Considerable improvement followed. The hallucinations became entirely conscious, or they were only illusions. The voices became lower and gradually unintelligible, and in two months and a half the tinnitus finally ceased.

Case III. The patient, who was seen by Dr. Michaelis in 1905, was a young man and an epileptic. He had auditory hallucinations. His ears were affected by a mild tubal stenosis and by adenoids. He complained of mucous tinnitus. Treatment was given by applications of nitrate of silver solution, which quickly relieved his condition, and the hallucinations promptly ceased.

Case IV. I saw this patient at the Presbyterian Hospital. She was a married woman, thirty-four years old, and had one

child. She was mildly alcoholic. Her antecedents were neurotic. Her father, brother and child were all psychopathic. The patient heard persecuting voices, and also complained of very loud tinnitus of varying character in the right ear and head. There was a history of a running ear. Inspection showed that the left membrana tympani was cicatrized. The right meatus was closed by a cicatrix just external to the position of the annulus. This ear had not discharged for three years. The nose was in a bad condition, irregularities and hypertrophies.

Treatment of the nose quickly lessened the hallucinations, but the tinnitus continued. An exacerbation of the hallucinations occurred in six weeks. The patient was then taken into a hospital, and in three days the hallucinations had ceased and in five days the tinnitus also.

Conclusions. The evidence points out a logical connection between ear disease and hallucinations of hearing.

In a susceptible, psychopathic individual, hallucinations may be excited by the irritation of subjective noises.

Improvement, or cure of the coincident ear affection may logically be expected to cause an improvement or cure of the auditory hallucination.

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MENIERE'S COMPLEX OF SYMPTOMS—WITH A
CRITICISM ON QUINCKE'S LUMBAR PUNCTURE
TREATMENT AND AN ACCOUNT OF THE
FIRST RECORDED CASE TREATED
SUCCESSFULLY BY HYPNOTIC
SUGGESTION.

BY T. WILSON PARRY, M. A., M. D.

Much has been written on the subject of aural vertigo and its relation to certain other associated symptoms. Besides numerous general text books that devote each its chapter to an inquiry into the consciousness of disordered equilibration, a number of special text books, going further into detail and weighing the opinions and theories of students who are endeavoring to solve some of the difficult and delicate problems that present themselves in connection with this subject, are also before the medical profession. In addition to this I have before me a list of over 260 papers written in English, German, French, and Italian, contributing facts of both analytical and synthetical importance bearing direct relation to that complex of symptoms to which Prosper Meniere first called attention and to which, in consequence, his name has been attached in the various forms of Meniere's "Disease," Meniere's "Syndrome," or Meniere's "Complex of Symptoms."

The first question we naturally ask ourselves is—Are these terms used by the profession as synonyms for one and the same clinical pathologic process, or has there been, in the lapse of time since it was first so brilliantly described by its French discoverer, a re-adjustment of terms, to keep pace with our growing knowledge of the subject?

On inquiry into the literature of the subject there is not the slightest doubt that much confusion has arisen from the indiscriminate applications of the term "Meniere's Disease,"

by authors to various conditions of both the internal and middle ears. The very fact that the term "True Meniere's Disease" exists is a confirmation of this. London otologists, at the present time, distinguish between two conditions. A case is either one of "(a true) Meniere's Disease," or it is one of "Meniere's Syndrome," "Meniere's Complex of Symptoms," or, simply, "Meniere's Symptoms." How does this agree with the consensus of opinion to be found in the literature of the subject to which I have already alluded? The answer is—partly, but not altogether, as follows—A large number of writers disagree with and criticise the "Meniere's Disease," and many others who do not, feel obliged to preface their remarks by an explanation of the term, a necessity which, it must be admitted, implies a weakness and lack of precision in our nomenclature.

I shall try to clarify the problem by defining the conditions that give rise to these similar sets of symptoms. There are three pathologic conditions which have to be considered in connection with this subject, and may be classified as follows:

Class I. *Primary Labyrinthine Lesion (or Irritation)*—(A) An acute exudation or sudden hemorrhage into the labyrinth. This is the "(true) Meniere's Disease" of all authors. (B) Chronic labyrinthine lesion, not due to the above causes. The causes of the cases of this class are usually obscure. This is the "Meniere's Disease" of some authors and the "Meniere's Symptoms" of others.

Class II. *Secondary Labyrinthine Source of Irritation*.—In this class of cases labyrinthine disturbance is produced by extra-labyrinthine causes. These are chiefly tympanic in origin. This is the "Meniere's Symptoms" of all writers.

Cases of true Meniere's Disease are of extreme rarity. Indeed, so great an authority as Frankl-Hochwart (1), who has searched the whole field of otologic literature, has only been able to collect some twenty-seven assured cases. Gottstein (2), in a period of thirteen years, only came across three. Cases, on the other hand, that I have placed in my Class I, B division, are by no means uncommon. It is in dealing with this class of cases that confusion arises in the minds of clinical observers. In my Class II. are to be found all those cases in which irritation of the labyrinthine nerves is set up, indirectly, by some disease or disorder of the extra-labyrinthine origin. These cases are too numerous to mention, but must not be

omitted from a classification of this kind, as the Meniere's "Complex of Symptoms" may be imitated so closely that the cases are often diagnosed as Meniere's Disease. I say "closely imitated," because there is one point of difference that may be distinguished with ease; this is that the deafness belonging to Class I. is of nerve origin, while that, if deafness there be, in those of Class II., is due to defect or disturbance in the sound-conducting and not in what is, perhaps wrongly, called the "sound-perceiving" apparatus.

I shall now describe the symptoms of "(true) Meniere's Disease" (Class I., Division A), contrasting them with those of Meniere's Disease (so-called); (Class I., Division B), and with cases exhibiting Meniere's Symptoms, but not of primary labyrinthine origin (Class II.). There are three symptoms of primary importance that may present themselves in all three conditions—viz., (1) deafness, (2) tinnitus, and (3) vertigo; and others of perhaps less importance to the diagnostician, but of no small consequence to the patient; these are nausea, vomiting, faintness (even to syncope) and profuse perspirations. In true Meniere's Disease deafness occurs with dramatic suddenness. Previously to a definite day and hour—nay, even to a very moment, there may have been no impairment whatever of either auditory organ. From this moment vertigo and tinnitus simultaneously make their appearance. Vertigo usually occurs in attacks varying in degree from the slightest swimming in the head to the severest paroxysm, when the patient feels either himself or his surroundings whirled rapidly round in one particular direction. His equilibrium being lost, he either falls to the ground or only saves himself from so doing by clutching at objects within his reach, while at the same time he retches or vomits, even to blood. A faintness then steals over him and he breaks out into a profuse, clammy perspiration. The tinnitus remains either as a perpetual singing, humming, or whistling in the ear, or as sudden outbursts of shrill sounds, the noise of falling cascades or reports as if firearms were being discharged.

In Meniere's Disease (Class I., Division B), and in those cases that exhibit Meniere's Symptoms (Class II.) the symptoms usually begin very gradually. To begin with, there is sometimes only occasional singing in the ear and perhaps slight deafness; then the singing becomes continuous, and the deafness gradually but surely increases, till later, when

the deafness and tinnitus become prominent symptoms, vertigo steps in with its alarming paroxysmal intensity, and not rarely, combined with nausea, retching and vomiting, completes the clinical picture of Meniere's Symptoms.

When these "Symptoms" have once set in definitely, it is practically impossible to say, without going carefully into the history of its origin, whether the case in point is one of true Meniere's Disease (Class I., Division A), or one of its counterfeits (Class I., Division B, or Class II.), for the affection is as vexatious and persistent as true Meniere's Disease itself. I have notes in my case-book of many cases of Class I., Division B, and it is remarkable that with all the irksome anxiety to which some of its victims have to submit, their friends are sometimes incredulous enough to regard them as troublesome neurotics.

What is the pathologic interpretation of this group of symptoms? Let us first take those of *true Meniere's Disease* (Class I., Division A).

The first case that Meniere was able to study, both clinically and pathologically, is too well known to be described again. The acute "Meniere's Symptoms," recorded clinically during life, in that case were associated with a reddish, plastic exudate, found after death, in the semi-circular canals, and partly in the vestibule. It was of the nature either of a rapid exudation of blood-stained serum or of a hemorrhage. There is no doubt that to coincide with the sudden onset of the clinical symptoms, the pathologic change must be a very rapid one; and this is consistent with a rapid exudation into the membranous labyrinth causing a sudden increase of intra-labyrinthine tension. Since Meniere's time a considerable number of post-mortem examinations have been made of fatal cases of leucocythemia (3), in which pronounced Meniere's Symptoms were present during life. In these, examination after death showed hemorrhages into the semicircular canals, vestibule and cochlea. If the one essential characteristic of true Meniere's Disease not supervening on a previous disease be labyrinthine apoplexy, then these are all undoubted cases of true Meniere's Disease; for the microscope clearly reveals the peri-lymphatic space between the membranous and osseous semicircular canals completely filled up with an effusion of blood, some of which has been organized into newly-formed bone. The scala tympani of the cochlea is also seen to be

filled with organized blood clot. The symptom of sudden vertigo is thus easily explained by a sudden escape of blood or serum into the labyrinth, which increases intra-labyrinthine tension by the extra amount of fluid pressed into the space that only holds a constant quantity of peri-lymph under normal circumstances. Excessive mechanical pressure thus induced, acting on the vestibular nerve-endings, produces an irritation which provokes the urgent consciousness of disordered equilibration. The symptoms of tinnitus (positive) and deafness (negative) are auditory phenomena, and are due to irritation and loss of function, respectively, of the cochlea branch of the auditory nerve. (This inference is borne out by those analogous cases of leucocythemia in which hemorrhage, or its organized results, are discoverable in the cochlea after death.) This "auditory" nerve travels to the nucleus accessorius, thence as auditory fibers along the *striae acusticae*, and, ascending in the *lemniscus*, passes upward to the cerebrum without the intermediation of the cerebellum, to which the equilibrical fibers eventually find their way. The other symptoms—viz., pallor, prostration, syncope, cold clammy sweat, nausea, and vomiting, are explained by a passing stimulation of the adjacent medullary centers (cardiac, vaso-motor and secretory), which lie in close anatomical relation with the nucleus of the eighth nerve. To explain the symptoms of faintness or syncope that may occur synchronously with vertigo, Dr. Woakes (4) has pointed out a line of direct communication between the heart and the labyrinth. While the sound-conducting apparatus is supplied by the external and internal carotids, the sound-receiving apparatus is supplied by quite a different blood supply—viz., the vertebral. On this artery a rich plexus of nerves, derived from the inferior cervical ganglion, finds its way to the labyrinth, and from this ganglion also proceeds one of the principal nerves controlling the heart's action. It is not therefore surprising that vertigo may induce faintness or syncope, or conversely that these may accompany a well-defined attack of Meniere's Symptoms.

How, secondly, do we explain pathologically the Meniere's Symptoms that occur in cases of Meniere's Disease (Class I., Division B), and those in Class II., of secondary labyrinthine irritation, that exhibit these symptoms.

It has seemed to me that these symptoms may be caused, in the first instance, not only by the mechanical causes to which

I have already referred—i. e., by an increased quantity of fluid, by its presence temporarily raising intra-labyrinthine pressure and thus stimulating the peripheral expansion of the equilibrial nerve to produce the consciousness of disturbed equilibration—but that the quality of the lymph may bring about the same result. Is it not reasonable to think that quantities, even of an infinitesimal amount, of toxic substances present in the endo- or peri-lymph may act in a chemical manner upon the exquisitely sensitive ampullar nerve-endings of the auditory nerve? Would not this account for the action of certain drugs—quinin, to-wit—which, in a toxic dose, will produce the trio of Meniere's Symptoms? Hitherto no good explanation appears to have been offered of the action of these drugs which, when administered in toxic doses, produce vertigo. Might not such an impurity account for gouty vertigo also? The gouty diathesis implies a toxic condition of the blood from either an excess in production of the toxic results of metabolism or from defective elimination and consequent accumulation in the system. Is it not likely that toxic material of one kind or another may enter the labyrinthine endo- and peri-lymph, which lies close to the labyrinthine blood vessels, and acting on the impressionable ampullar nerves, whose end-organs it continually bathes, warn the individual by the disconcerting sensation of vertigo of the presence of a danger needing immediate attention? To me this speculation appears most probable, and although I have unfortunately not the opportunity of proving the correctness of it, it seems to me to be one well worth investigation, although on account of the small amount of endo- or peri-lymph at disposal for investigation and the probable lack of delicate enough analytical apparatus, a negative result of any such experiment could hardly be taken, at present, as disproof. To a dog a toxic dose of quinin sufficient in its case to cause definite vertigo might be given and then having been killed immediately traces of this alkaloid might be sought either in the endo-lymph or in the cerebro-spinal fluid, which is in direct communication with the peri-lymph of the labyrinth.

As regards the relation of the symptoms of Meniere's Disease to the pathologic condition of cases belonging to Class II, it has seemed to me that when one considers the minuteness of dimensions of the tympanum (some five lines from before backward, three lines in the vertical direction and between

two and three in the transverse), it is not difficult to conceive that if there be a chronic fetid discharge with obstructed egress from a partially blocked Eustachian tube and, maybe, a perforation in the tympanic membrane, perhaps small and highly placed doses of toxic material may under certain circumstances find their way into the labyrinthine lymph by permeating the thinned or eroded labyrinthine walls, or by penetrating an affected fenestral membrane and thus causing irritation of the vestibular end-organs and giving rise to well-marked Meniere's Symptoms. Would not this explain why Meniere's Symptoms so frequently occur in cases of otitis media?

Of extra-labyrinthine causes in the production of Meniere's Symptoms, affections of the tympanum may most frequently be held to account. Otitis media is by far the commonest cause of the malady, but any disorder or disease of the middle-ear producing pressure on the foramen ovale, and thus increasing intro-labyrinthine pressure, may give rise to its well-recognized trio of symptoms. Fixation of the stapes is answerable for a large majority of such cases. In a series of cases published by Burnett (5), the well-known American otologist, excellent results appear to have occurred in the case of retracted and ankylosed ossicles by, first, removing the malleus in order to liberate an impacted stapes; secondly, by removal of both incus and stapes; thirdly, by removing the stapes only, and, fourthly, by simply breaking off and taking away the long process of the incus. Burnett came to the conclusion that it is the best treatment to employ the last method, especially as it is followed by the least inflammatory reaction. By removing the long process of the incus, a severance of the retractive power of the incus from the stapes is brought about, intra-labyrinthine pressure is reduced, and the tympanic vertigo relieved. He thought that puncture of the foot-plate of the stapes would be justifiable for relief of intra-labyrinthine pressure, but I can find no recorded case of this having been attempted. Spasmodic contraction of the tensor tympani muscle, or paralysis of the stapedius by allowing the foot-plate of the stapes to sink into the oval opening, will also produce the vertigo of Meniere's Symptoms. Politzer (6) describes a case in which a bony growth on the external labyrinthine wall, that had grown over the foramen ovale and was united to the stapes, produced symptoms of true Meniere's Disease, and I have notes of a case of cholesteatomata in the tympanum

producing Meniere's Symptoms. Condition of the external auditory meatus in which there is lodged a tightly-fitting foreign body or a plug of cerumen, together with an impermeable Eustachian tube, will produce, according to atmospheric changes, a positive or negative pressure in the tympanum, and this will give rise sometimes to well defined Meniere's Symptoms, which are, of course, readily cured by the removal of the foreign body or cerumen and the opening of the Eustachian tube by the catheter and india-rubber air-bag. Moos (?) relates a case of Meniere's Symptoms that was sent to him, when he was in charge of the ear clinic, from the medical clinic, diagnosed as a case of Meniere's Disease. All the symptoms (vertigo, deafness, tinnitus and vomiting) disappeared on removal of a plug of wadding from the right ear. Another cause of secondary labyrinthine lesion (Class II.) is cerebro-spinal meningitis. In this disease an otitis labyrinthica is set up by direct communication from the cerebro-spinal fluid of the peri-lymph of the labyrinth. Gottstein cites two cases in children which were brought to his clinic suffering with deafness (tinnitus and staggering gait. He found there had been an outbreak of cerebro-spinal fever in the district from which they came, and although these individuals had not been under medical care, the time they were acutely ill was found to be coincident with that of the cerebro-spinal fever epidemic. Cohn of Breslau found evidences in the eyes of such a nature as to lead him to suppose, as the eyes and ears of these two patients had been affected at the same time, that they had both had cerebro-spinal meningitis.

The treatment of cases belonging to Class I. has not been at all successful up to the present. The drugs recommended, apart from the primary aperient and stomachics, are the bromides, quinin, potassium iodid, salicylates, arsenic, ammonium chlorid and gelsemium. If the symptoms are of syphilitic origin calomel and potassium iodid is the treatment *par excellence*. In other cases the bromides and quinin are undoubtedly by far the best drugs. Charcot was the first strongly to advocate quinin, and in a paper by Dr. E. Meniere (8) ["Causes et traitement du vertige de Meniere"] this author, who has taken special interest in the disease that was first described by his father, urges that, without neglecting other therapeutical means, quinin ought to be always prescribed, as it has often been successful. Dr. J. M. Bradley (9) com-

ments on the fact that although many recommend the use of quinin, no directions are given for its administration. He lays down rules for the treatment. He begins by finding out for the particular patient the minimum toxic dose of the drug, and taking this as a starting point, he increases the drug gradually until the patient begins to complain of an increase in the tinnitus. This limit is taken as the patient's maximum dose, and is the dose, he affirms, which will control the paroxysms of vertigo. As quinin is quickly eliminated from the body, being practically gone in twenty-four hours, he does not propose to keep the patient on the maximum dose, but gives it in such a way that the good effects of the maximum dose, without cinchonism, will be kept up without having to reduce it suddenly to the minimum dose on account of intolerance from toxic discomfort. In a case of true Meniere's Disease (10), published by myself at the beginning of last year, I gave excellent temporary relief of symptoms by the application of a seton in the nape of the neck; and Mr. Colin Campbell (11) published a case of Meniere's Symptoms in which similar treatment produced the happiest possible results. In my own case unfortunately I left the neighborhood before the treatment was established on a sound footing, namely, on April 25th, 1902, when the patient had been under my watchful care for over two years. On the following September 17th my successor wrote me: "— had no fit after you saw him, resumed light work at the end of May and went back to his own work in the second week in June. On June 23d I removed the seton. On July 26th he had a severe attack of vertigo and three days later he had two severe attacks, with one of which he vomited. I introduced a fresh seton on July 30th, and since then he has had no severe fit, and laterly none at all; he has now resumed light work." To sum up—I introduced the seton on April 6th, and from April 10th to July 26th (a period of three and one-half months) there was no fit whatsoever. After the seton was removed, a thing I should never have done myself, had I been still treating the case (as six months is the minimum time for inseton), the attacks remained in abeyance for a month, and when a fresh seton was inserted on July 30th the attacks vanished again and did not return for another three months at least. Unfortunately, no accurate account was kept after my note of September 17th, but on the following March 10th I had word to say that the patient had been free from

attacks "for a time," and then had gone to work with the seton in *situ*, and had had a recurrence of the vertigo subsequently, when the seton was withdrawn. At this period, again, had the case been under my care, I should have immediately recalled him from his work and inserted, if necessary, a second seton. The reasons I have such full faith in the seton, after drugs have been found to be of no avail, are the following:

1. When a seton^r is placed at a spot not far removed from the position of any lesion, the determination of blood to this new surgical site will tend to diminish the quantity of blood at the affected part.

2. I believe that it acts reflexly on the vaso-motor system by means of the sympathetic, so as to cause constriction of the vessels in the vicinity of the lesion.

3. The presence of a seton causes a definite physical effect by determining a constant and continuous "reminder" of its presence. Its presence, acting on the central nervous system, produces a transference of the consciousness of a trouble of one kind, in one part, to that of a different nature in another.

From personal observation I am quite assured of the fact that anyone suffering from "Meniere's Symptoms," unless possessed with an inordinate strength of will and character, will, after a time, become apprehensive of a dreaded attack taking place—nay, some, indeed, actually live in terror of their approach—and this very apprehension may produce a vertigo, which, though not due to the original cause, occurs from vaso-motor disturbances and simulates the primary attack itself. Just as some suffer from morbid blushings of the face, due to disturbances of the sympathetic system from emotional causes, so hyperemia of the labyrinthine vessels may be produced by fear and anticipation of a recurring paroxysm of vertigo. If such a treatment can be of practical use in true Meniere's Disease, it is a treatment I should unhesitatingly recommend for any case of Meniere's Symptoms that does not quickly and certainly respond to drug treatment.

Lumbar puncture is another method of treatment that has been recommended and tried for this disease of nerve-irritation. In a case attached to this paper I have added some remarks on the principles that underlie this method of treatment. I will, therefore, leave the case and its remarks to stand for themselves.

I have pleasure in being able to place before you a case of Meniere's Disease (Class II.) the new treatment of which—viz., hypnotic suggestion, has been eminently satisfactory. So far as I am aware, it is the first case in London treated in this way; and even in Paris, the home of hypnotism, one has not read of any cases that have been treated by this new method. The honor of recommending this treatment and carrying the case to a most successful issue is entirely due to Dr. A. Ernest Jones, of University College Hospital. It has been my privilege to witness the treatment of this case from the outset. The brilliant result, as will be seen from the full notes adjoined to this article, far exceeded our most sanguine expectations. The picture of the cure of a man of some forty-four years, who had become prematurely old from the constant worrying and depressing effects of eight years' unbearable tinnitus, vertigo and vomiting is vivid enough without further comment.

PRESENTATION OF CASES BEFORE THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL, AND OTOLOGICAL SOCIETY, BOSTON, 1905.

Tympano-Mastoid Exenteration, Showing Healing of Cavity by Blood-clot, and Wound by Subcutaneous Silk Suture: Dr. Frank B. Sprague of Providence, R. I., showed this case. The patient was a boy of 19, who gave a history of chronic suppurative otitis media dating back fifteen years. Three weeks ago Dr. Sprague performed a radical mastoid operation after the Stacke-Zaufal method. The cavity was allowed to fill by a blood-clot up to the drainage tube, and the external mastoid wound was closed by subcutaneous silk sutures, so that now the scar was scarcely visible. An ordinary cigarette drain was inserted into the tympanum and allowed to come out through the opening of the canal, in which was placed a stiff rubber drainage tube, about half an inch in diameter, for the purpose of giving a good conformation to the canal, and an opening of sufficient size to insert the dressings. The tube was allowed to remain in about a week. At the present time, the whole canal was well formed, and new skin formation was well under way. The case was a good illustration of what the organized blood-clot could do in the repair of the mastoid wound in chronic cases, where radical operation was necessary.

This patient, Dr. Sprague said, prior to the operation had suffered from epileptic convulsions during the past seven years, the seizures coming on about twice weekly. Since the operation he had been entirely free from attacks, and it would be interesting to note whether it would have a permanent beneficial effect on the epilepsy.

A Case of Angio-Neurotic Edema: Presented by Dr. O. B. Douglas of Concord, N. H. The patient was a man, 41 years old, who recently came under the speaker's observation, complaining of a sudden swelling of his tongue. He stated that last Christmas he had had for the first time a similar experience. The swelling first involved one edge of the tongue, and gradually extended to the other, subsiding on the side first affected as it increased on the opposite side, and usually disappearing in the course of twelve hours.

He had also had similar manifestations involving the right arm, face, scrotum, etc., subsiding usually in twelve hours. There was never any pain nor rise of temperature, and usually no premonitions nor discoverable immediate cause. The patient was an habitual drinker of Bass' ale, and occasionally of whiskey. His appetite was usually good; his bowels were regular.

The case was interesting, Dr. Douglas said, on account of the possible occurrence of edema of the glottis during one of these attacks. Osler had reported a number of similar cases, in two of which death occurred from acute edema of the glottis.

DISCUSSION.

Dr. Wolff Freudenthal of New York said that from the history given by Dr. Douglas, he was inclined to regard the case as one of urticaria or giant urticaria. He had observed a number of such cases, and in one that he reported about fifteen years ago the larynx was affected. The usual history obtained from these patients was that the attacks followed some indiscretion in diet, and that fact should not be lost sight of in the treatment of these cases.

Dr. Thomas H. Halsted of Syracuse, N. Y., said he agreed with Dr. Freudenthal that Dr. Douglas' case apparently belonged to one of the varieties of urticaria, and was closely allied to anglo-neurotic edema. In three such cases that had come under his observation, two developed edema of the glottis.

Dr. Halsted said that one of the most important features in connection with this condition was the possibility of its following the use of diphtheria antitoxin. It was well known that this remedy frequently gave rise to various types and degrees of urticaria and of angio-neurotic edema, and the possibility of its causing edema of the glottis, which might be mistaken for the presence of diphtheritic membrane in the larynx, should not be overlooked.

Dr. Charles W. Richardson of Washington, D. C., said he thought the case shown by Dr. Douglas was one of angio-neurotic edema, and when it affected the larynx there was usually a great deal of infiltration of the tissues of the neck. In many of the cases there was a marked hereditary taint, and in one case that came under the speaker's observation the condition could be traced back through three generations. The father had had three attacks in which there was marked edema

of the pharynx and larynx, with threatened suffocation, and the son had two similar but less severe attacks. One peculiarity of the hereditary factor in these cases was that the male members of the family were more prone to be affected than the female. The condition was often associated with errors in diet. It usually subsided very quickly upon purgation and free incision.

Dr. William L. Ballenger of Chicago, Ill., said that about eight years ago he reported a case of angio-neurotic edema which was apparently similar to the one shown by Dr. Douglas. The patient was a young woman of 23, who was on her way to the theatre. While on the train she developed a severe headache, and after traveling about five miles she had an attack of suffocation. She left the train at the next station and was brought to Dr. Ballenger's residence. When he saw her, she was suffering from acute dyspnea, and upon examination he found the uvula, the lateral wall of the pharynx and also the glottis somewhat edematous. In addition to that, both sides of the nose were edematous and much infiltrated, and the patient was in an extremely nervous state of mind. Under the use of astringent applications, the condition practically disappeared at the end of twenty-four hours.

In this case there was no history of any other member of the family ever having been similarly affected. The young woman was a teacher; she was of a neurotic temperament, and had considerable digestive disturbance. There had never been a recurrence.

Dr. J. A. Stucky of Lexington, Ky., asked if there was any history of rheumatism in Dr. Douglas' case. He was inclined to believe that these manifestations were associated with the acute lithemic condition.

Dr. Lewis A. Coffin of New York inquired as to the condition of the stomach and bowels in Dr. Douglas' case, and said that while the causes of these manifestations were numerous, he thought that in the majority of cases the condition was due to gastro-intestinal trouble. In one case under his observation, a woman, the immediate symptoms were quickly relieved by sedatives, and this, followed by lavage of the stomach and bowels, gave relief for some time; in fact, until another attack was brought on by some indiscretion in diet.

Dr. James E. Logan of Kansas City, Mo., said he had noticed that many of these patients partook liberally of cheese, especially in the form of Welsh rarebits.

Dr. John F. Culp of Harrisburg, Pa., mentioned the case of a woman who developed this condition every time she indulged in eating nuts, and her last attack was produced by eating a small quantity of nut candy. The tongue and palate became very much swollen, and suffocation seemed so imminent that preparations were made to do a tracheotomy. Under applications of cocain solution, however, and the use of ice, she became comparatively comfortable in a few hours. This patient, Dr. Culp said, had long suffered from chronic indigestion, and had some trouble with her bowels.

Dr. Harry L. Myers of Norfolk, Va., mentioned a case in which the edema involved the eyes. This patient gave a distinct history of rheumatism and asthma. In another case the larynx was much affected. The treatment that seemed most efficacious in the cases he had seen was large doses of benzoate of soda and injections of pilocarpin.

Dr. O. B. Douglas, in closing, said that during the patient's first attack adrenalin chlorid was applied, and apparently had some good effect. It was tried again in the second attack with no effect whatever. Appreciating that the condition was neurotic in character, he administered whiffs of chloroform until the patient became unconscious, when for the first time the swelling remained stationary. It did not, however, immediately begin to subside.

In reply to various questions, Dr. Douglas said that this man gave no history of rheumatism; he had never been poisoned by ivy or sumach; he was not constipated and had never complained of any stomach symptoms.

Dr. Douglas said that in another case that came under his care recently the edema of the larynx was relieved by spraying with adrenalin chlorid solution, and recovery was very prompt. That patient was a woman.

PRESENTATION OF INSTRUMENTS BEFORE THE
AMERICAN LARYNGOLOGICAL, RHINOLOGICAL
AND OTOLOGICAL SOCIETY, BOSTON, 1905.

Dr. Chevalier Jackson of Pittsburg, Pa., exhibited a number of new instruments, including a *bronchoscope*, an *esophagoscope*, a *tracheoscope*, a *laryngo-pharyngeal speculum*, and a long forceps, and gave a practical demonstration of their use.

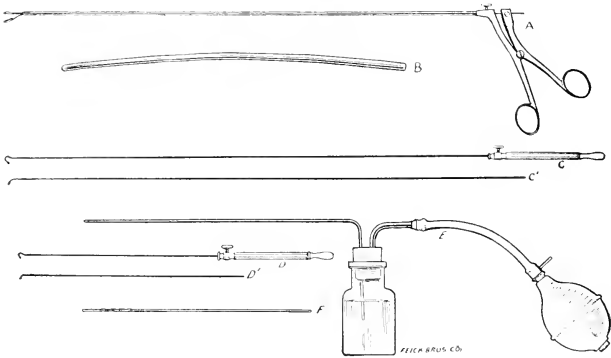
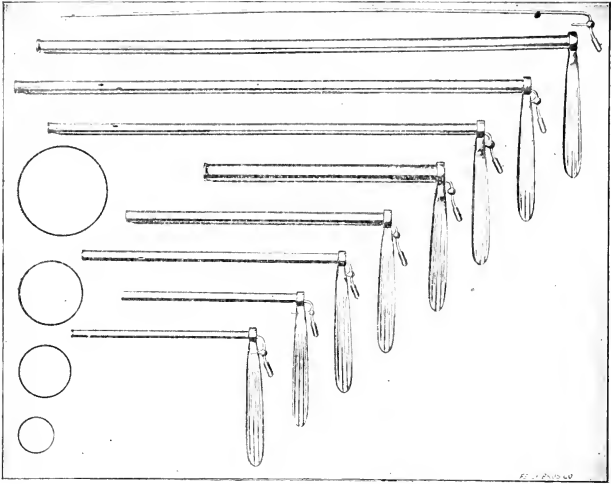
Dr. Thomas J. Harris of New York asked Dr. Jackson whether the lamps in the instruments he had shown worked properly. He had heard the criticism made that because of deposits of mucus, or for other reasons, the lamps frequently went out in the course of the manipulations, and on that account some operators had gone back to the use of a good reflecting head-light.

A New Septum Cutter: Dr. William L. Ballenger of Chicago showed this instrument, and demonstrated its use. It was devised for the purpose of facilitating the sub-mucous window-resection of the nasal septum. The mucous membrane was first incised and elevated, and then a small incision was made in the septum. The septum cutter was then introduced, and the operation was rapidly completed. By means of it, a window-resection of the septum could be done in a very few minutes.

Dr. Ballenger also showed an improved tonsillar snare for the partial removal of the tonsil.

An Improved Head Lamp: Dr. J. A. Stucky, of Lexington, Ky., said that one great desideratum in the nasal sinus and mastoid operation, as well as operations within the pharynx, was plenty of light without too much heat. He considered the lamp he showed an improvement on the Jackson lamp in that it did away, (1) with the metal reflection; (2) it fitted the head comfortably, and could be worn for hours with ease; (3) the sixteen candle power lamp used did not produce as much heat as the ordinary ten candle power; (4) the lamp could be removed or adjusted by an assistant without the operator touching it.

A New Septotome: Dr. Walter A. Wells, of Washing-



DR. JACKSON'S INSTRUMENTS.

ton, D. C., showed this instrument, the purpose of which was to cut out of the cartilaginous portion of the septum a tongue-shaped flap, and to accomplish with a single incision at least as much as was done in the Asch operation with two separate incisions. This overcame the necessity of removing one set of scissors to substitute another, which might prove a serious drawback in case one was operating upon a nervous patient under a local anesthetic.

In the Asch operation, the result of the incisions was to create four small triangular segments, with their points in apposition, which meant that we had four possible points of sloughing. With the instrument shown by Dr. Wells, but a single flap was cut, and this having what many rhinologists considered the ideal shape for this operation, the chances for sloughing should be decidedly lessened.

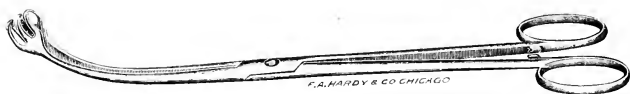
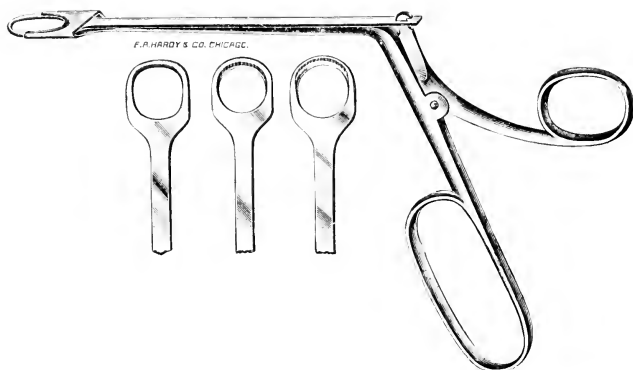
By means of a screw, the tongue-shaped flap might be shortened to any desired length. The instrument was so constructed that the flap, when cut, was bent well to the other side, thus converting the two stages of the Asch operation into one. Moreover, he thought a decided advantage was gained over the Asch instrument as regarded the introduction of the septotome. There was, in the latter, no sharp point to become engaged in the tissues as it was being introduced. It had a large and a small jaw, the former for the free side; the latter for the side obstructed. Even though one side of the nose be completely obstructed, the shape and size of the smaller jaw was such that it might be wedged in without any laceration of the tissues.

The object of the flat band of steel, which was attached to the larger jaw of the instrument, was that it would act as a spring, and force back into the median line the flap that had been cut out of the septum, a very important provision to prevent its being caught by the instrument as it was being withdrawn.

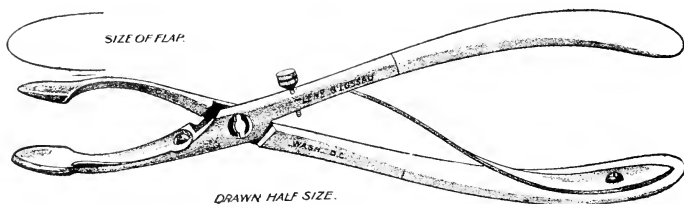
Modified Head Lamp: Dr. Wendell C. Phillips of New York showed this lamp at the request of Dr. H. Bert Ellis. It was a Nernst light, and could only be used with the alternating current.

Dr. H. P. Mosher of Boston showed the following new instruments:

1. A *wire check and lip retractor* for use when entering the antrum through the canine fossa, and for dressings by the same route after the operation. The retractor was made of wire



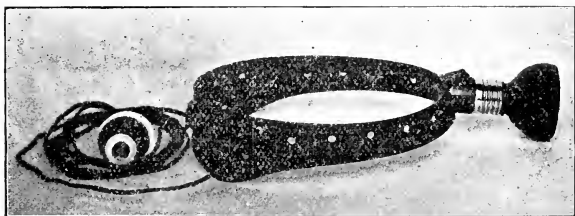
DR. BALLENGER'S TONSIL INSTRUMENTS.



DR. WELLS' SEPTOTOME.

and thus was lighter than the ordinary retractor made for that purpose. It had its three prongs so bent that the canine fossa was widely exposed. One end of the retractor was made for the right cheek, and the other for the left. The retractor could be used in order to expose the teeth and gums of both jaws in the ordinary routine of the first examination of a patient.

2. A *safety pin closer* for use in the esophagus and the trachea. This device was originated for the case of a patient with an open safety pin, point up, in the esophagus. The essential part of the safety pin closer was a ring placed at right angles to the end of a long wire handle. The size of the ring was such that it could pass a large esophageal tube, while the handle was of a sufficient length to allow the ring to pro-



DR. STUCKY'S HEAD LAMP.

ject well beyond the end of the tube. A forked wire was used with the ring in order to engage the knee of the pin and push it through the ring. As this was done, the point of the pin was disengaged from the mucous membrane and the pin closed. The safety pin closer could be improvised very easily for any length and size of tube, and for any sized pin. A set of esophageal instruments should have two or three rings of different sizes. By bending the ring upward, so that it was more or less parallel with its long handle, it made a good penny catcher, and by bending the handle somewhat an inch or two above the ring, the ring could be made to hug and explore the front wall, the posterior wall or either side of the esophagus at will.

3. A *nasal splint*. This splint was devised in order to treat

a case of fracture of the orbital rim of the superior maxilla combined with a fracture dislocation of the nasal process of the same bone. The upper end of the nasal process of the right side projected very markedly outward and caused great deformity. The deformity was readily reduced, but the usual bandages and splints would not hold the fracture in the corrected position. The base ball mask splint was then made. It held the fracture easily, and the result was excellent. The advantages of the new splint were its steadiness and its power.

The splint consisted of an ordinary base ball mask, with two set screws. These could be adjusted laterally and vertically, so that pressure could be applied at any given point on either side of the nose. Owing to the support which the splint obtained from the forehead, the chin and the sides of the face by the pads placed at those points, the mask could be bound firmly to the head and face, so that it could not slip. The wires of the mask gave such a fixed point of departure for the application of the force of the set screws that as little or as much pressure as was desired could be used. In this way, the splint could be employed either as a retaining apparatus for a fracture, or as a correcting apparatus after operations for old fractures of the nose, with lateral deformity. With such a splint it would be possible to do a certain amount of orthopedic work, so to speak, on the nose.

After the pressure of the screws was no longer necessary, the screws could be removed and the mask worn alone for a time as a safeguard against any accidental trauma. In the case where the splint was first used, the child wore the mask in this way for a few days. This allowed the parents to leave her at night without anxiety.

EXHIBITION OF SPECIMENS BEFORE THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOTOLOGICAL SOCIETY, BOSTON, 1905.

Epithelioma of the Larynx: Dr. Chevalier Jackson showed this specimen, which was one of squamous-celled epithelioma of the larynx, and was removed post-mortem from a patient who had been under the care of Dr. E. S. Montgomery, of Pittsburg. Laryngectomy had been refused by the patient.

Epithelioma of the Antrum: Dr. Jackson also showed this specimen, which was removed from a man about sixty. The entire upper maxilla was involved in the epitheliomatous process, and was removed. The patient lived for two years after the operation without a recurrence. The preliminary ligation of the external carotid rendered the operation practically bloodless, and thus a tracheotomy was unnecessary.

Epithelioma of the Larynx: Dr. Jackson also exhibited this specimen, which was one of laryngeal epithelioma perforating the thyroid cartilage. It was removed by total laryngectomy, taking out the glands at a subsequent operation. There was a fatal recurrence at the end of four months.

Killian's Inspection of the Trachea and Esophagus: Dr. H. P. Mosher of Boston demonstrated this on the dead in a sitting position, as was usually done. Dr. Mosher said that a much better view of the parts could be obtained by placing the patient on his back, with the head hanging down over the edge of the table. If Killian's method failed after a short trial, he advised doing a tracheotomy, and then inserting a pair of bent forceps and seizing the foreign body under the guidance of a Kelly cytoscope.

In the removal of foreign bodies from the esophagus, Dr. Mosher said he did not favor the use of the old-fashioned probang.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINO- LOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Removal of the Semicircular Canals in a Case of Unilateral Aural Vertigo.

RICHARD LAKE (*The Lancet*, June 4, 1904) reports the case of a woman, aged 21 years, who had been the subject of attacks of aural vertigo, combined with sickness and vomiting, with gradually increasing deafness and tinnitus, the whole duration of the disease being five years. No cause could be found for the origin of the deafness. During this period she had been subjected to long courses of treatment, both by careful dieting and by the administration of various drugs of repute for the relief of these symptoms. She was first seen six months before the operation about to be described was performed. As she stated that she thought the use of her eyes in reading and in needlework tended to induce the attacks, she was examined at St. Thomas's Hospital by Mr. J. H. Fisher, who diagnosed slight hyperopic astigmatism, and ordered her appropriate glasses, which she wore until a fortnight before the operation. She, however, stated that the use of these glasses made no difference as to the frequency of her attacks. The attacks were heralded in usually by increased tinnitus, which not infrequently came on while she was lying down. The tinnitus persisted after the sickness and vertigo had ceased. She was unable to state that objects took any particular course during the attacks or that she felt any tendency to fall in any particular direction.

During the six months in which she may be considered to have been under treatment she was for some time given a dram of quinin daily in three doses, each dose being administered with a dram of hydrobromic acid. She also took iodid, strychnin, belladonna and mercury, yet during this time not only did she obtain no relief, but her attacks increased in frequency, often recurring after an interval of only one day, though for the last two years and more she had never been free from an attack for a period of more than two months. As a last final attempt to obtain relief before having to resort to an operation, which at the best could only be based on theory, she was taken into hospital and treated with hypodermic injec-

tions of pilocarpine. During these two weeks she had several attacks of vertigo. The examination of the ear gave the following results: Acoumeter in concha. The voice was heard at two feet; a whisper was not heard. Rinne's test with tuning forks C and C² gave negative results; C, mastoid, —30 seconds. On testing with tuning forks C and lower notes were not heard. C¹ was heard at 50 seconds; C² at 40 seconds; C³ at 30 seconds, and C⁴ 2048 at 25 seconds.

On February 16th, 1904, she was anesthetised and an ordinary radical mastoid operation was performed, with the exception that the innermost portion of the posterior wall was not removed, but the bony opening in the temporal bone was enlarged, forwards, upwards and backwards. Anteriorly it was extended into the base of the zygomatic process of the temporal bone and postero-superiorly in such a way that the long diameter of the bony wound was from above downwards and forwards. The malleus and incus lying exposed after the removal of the external attic wall were removed. At this period of the operation the burr was substituted for the cutting gouge which had been previously employed. The next step in the operation consisted in exposing the upper and outer surfaces of the external semi-circular canal in its whole extent. The antero-external portion of this canal was now followed forwards and inwards until the outer surface of the superior canal was brought into view. The whole of this canal was then removed by cutting it away with a medium-sized burr, leaving only the upper part of the arch or fornix untouched. The posterior rim of the external canal was then followed so as to bring into view the posterior canal, which was burred away entirely. A large oval burr was now substituted for the medium-sized one previously used and the upper surface of the external—the only remaining canal—was cut away with the burr until the anterior half of the membranous canal was exposed. This was then removed with a small burr, which was afterwards employed to make a medium-sized opening into the vestibule and an attempt was made to clean away the crista acustica at that end of the canal. The wound was then swabbed out with Lister's strong solution, a precaution which was considered to be necessary to adopt on account of the impossibility of carrying out our operative procedures under strict antiseptic precautions. The external meatus was divided longitudinally through

its posterior wall and the wound was packed and closed by the ordinary methods.

Immediately after the operation the patient suffered very severely from shock, which lasted for about an hour. Slight chloroform sickness supervened, but this was certainly hardly so much as is commonly the case. For the next 48 hours she lay coiled up on the right side, her thighs flexed on the abdomen and the legs on the thighs, in a position commonly described as that typical of cerebral irritation. During this period her eyes were tightly closed, but beneath the lids one could see that there were erratic movements of the eyeballs, and she resented any attempt to raise the lids, but though the light from the window fell directly on her face, she preferred not to have the window darkened. On the third day the wound was dressed and she would open her eyes if asked to do so, but preferred to keep them shut. When they were opened the eyeballs were subject to irregular rhythmical movements both upwards and downwards and laterally. On the seventh day she sat up; on the tenth day she was able to walk with assistance for a few steps, and on the fourteenth day she could walk easily from the small room in which she was into that adjoining, a matter of some 15 or 20 yards there and back. She could, however, only turn to the right or sound side. If she turned to the left she would have fallen over towards the right side. On the sixteenth day she walked downstairs with a little assistance and upstairs without any help. Her symptoms from that time lessened day by day. At the end of four weeks she was able to do everything without any fear of falling. Since the fourth day there had been no movement of the eyes, nor could any optic movements be induced by syringing the wound either with hot or cold lotions. It is now 14 weeks, or slightly over three months, since the operation. There has been no return of vertigo and the patient is enjoying better health than she has done for the last few years.

There are a few points in respect to this case which are worth considering. The first is naturally the indication for operation. That can only be arrived at with anything approaching certainty when one has more than a single case to consider. Those cases which would appear to me to be the most suitable are those in which, by a careful examination and after a course of treatment, one has proved that the vertigo cannot be controlled, and at the same time that the deafness is

sufficiently great to admit of no reasonable hope of alleviation, although, as will be seen when one comes to consider the question of tinnitus, the hearing does not appear to be diminished materially, and, indeed, the reverse was noticed in this case.

The operation itself is one in which the difficulties will be largely due to anatomical irregularities and to the age of the patient. In those skulls in which the middle fossa is at a lower level than the semi-circular canals the operation would of necessity be more difficult and tedious. As to age, all patients excepting those who have passed middle age have a dense petrous bone, and the definition of the canals is extremely difficult. With regard to the symptoms following operation, it is impossible to avoid the conclusion that the extreme shock and irregular movements of the eyes were not entirely disconnected with the use of Lister's strong solution, for we are aware that irritation of the canals causes greater movement than simple section, and strong and irritant antiseptics should not be employed. Finally, with regard to the tinnitus and the hearing power. The former was absolutely uninfluenced by the operation; that is to say her tinnitus is as bad as it was before. The hearing power, however, underwent a most extraordinary change. The voice, which had only been heard before the operation at a distance of two feet, was now well heard at five feet. Her bone conduction, which had previously been—30 seconds, was now—25 seconds, but whereas she had heard the C' tuning fork, although very badly, before she was unable to detect it by air conduction afterwards.

Wyatt Wingrave.

Local Anesthesia in Major and Minor Operations on the Ear, as Observed in Professor Politzer's Clinic in Vienna.

GEORGE P. MARQUIS and OSCAR H. KRAFT, Chicago, (*Journal A. M. A.*, April 22, 1905). Preparatory to an operation the patient was given a meal, as experience has shown that after a meal cocain is much less toxic. The patient is prepared as for any surgical procedure. The following three solutions are previously made:

(a) One per cent solution of eucain in distilled water with five drops tonogen to each c. c. (Tonogen is an Autrian preparation corresponding approximately to adrenalin.)

(b) One per cent solution of cocain in distilled water with five drops tonogen to each c. c.

(c) Solution of cocain, 20 per cent.

The operator first fills the syringe with the eucain-tonogen solution and places it in hot water until it is warmed to the temperature of 40 to 50° C. An assistant takes the place of an anesthetizer and watches the pulse, pupils and general condition of the patient.

The needle is inserted over the mastoid process, about midway of a line running vertically and at about the middle of the mastoid process, and forced upward through the tissues until it reaches the bone, when one c. c. of the eucain solution is injected beneath the periosteum. The syringe is now refilled, the needle inserted through the same opening, the direction being downward and the point carried in the region of the apex of the mastoid where 1 c. c. of the solution is injected beneath the periosteum. The syringe is again filled with the same quantity, but directed inward and somewhat backward. The external ear is now drawn forward and 1 c. c. of the solution injected between the anterior wall of the mastoid process and the cartilage of the ear.

A speculum is next inserted in the ear and 1 c. c. of the cocain solution injected into the superior wall of the ear at the point of junction of the bony and cartilaginous portions. Another syringe is injected into the inferior wall and a half-syringe each into the anterior and posterior walls. Injections must be made beneath the periosteum and in such a way that a protrusion of the wall can be seen following them. This protrusion soon disappears.

A small pledget of cotton is now saturated with the 20 per cent cocain solution and inserted into the tympanic cavity through the perforation in the tympanic membrane. The pledget is not removed until the antrum is opened in the regular course of the operation.

The parts are next covered with bichlorid dressing, which remains in place until the operation is begun. All in all, not more than four or five centigrams of eucain and three centigrams of cocain are used, combined with the adrenalin solution. Cocain is used for the injection of the auditory canal as its action persists longer than the eucain.

The symptoms following the injection are never alarming. In fifteen to twenty minutes the anesthesia and anemia for the radical operation are complete, and one can begin as in any radical mastoid operation. Only small pieces of bone can be removed at a time, and the chisel should be held as flat

as possible, thus avoiding concussion. The patient feels that something is being done, but has no symptom of positive pain with the single exception that the initial cut through the skin is sometimes felt. The reporters are convinced that with the exception of children and hysterical subjects nearly every patient can be operated on by this method, and that in a great majority of cases a general narcosis can be dispensed with.

This method can also be used in acute mastoiditis with the same technique, with the exception that concerning the posterior auricular region it is not necessary to inject cocain into the auditory canal. When there is subperiosteal abscess this interferes with the absorption of the solution.

For minor intra-tympanic operations they have found the method useful, such as for the extraction of polyps, granulations, endotympanal pseudoligaments, and even resection of the lateral wall of the attic. Ossiculectomy can also be done in the same way. The reporters have done intra-tympanic operations a number of times, with removal of the malleus and incus, on children without any pain and without the least sign of toxic symptoms.

The technique of the intra-tympanic operation is as follows:

"The ear is cleansed with deodorized benzine and washed with hydrogen peroxid or lysol solution. The syringe is then filled with the 1 per cent cocain-tonogen solution and warmed to 45° C. The speculum is now introduced in the ear and the needle inserted into the superior wall at the junction of the bony and cartilaginous portions. The needle is forced in until it reaches the bone, when a few drops are forced out of the syringe. The needle is then pressed cautiously forward and more of the fluid injected beneath the periosteum. In this procedure care must be taken that the needle is not forced through the cutis, or the fluid will escape into the auditory canal. Should this occur, the injection must be repeated two or three times until the covering of the superior wall bulges downward, showing that sufficient fluid is retained.

The syringe is cautiously withdrawn and a small pledget of cotton saturated with tonogen is pressed against the field of operation. After waiting from ten to fifteen minutes to allow the anesthetic to take effect, the operation can be performed without the slightest inconvenience to the patient.

On the completion of the operation the field is dusted with a mixture of equal parts of anesthesin and boracic acid to

counteract the severe pain which would otherwise develop in an hour or two following the operation. This indication is fully met by this powder, as in the cases where it has been used the patients have not complained of any pain subsequent to the operation.

The syringe used for these injections is of metal, holding 1 c. c.; and with a needle modified by Neumann. A pair of half rings (which are detachable) have been added to the syringe to facilitate the injection." *Richards.*

Two Cases of Lateral and Sigmoid Sinus Thrombosis, One with Jugular Exsection, Recovery Notwithstanding Meningeal Symptoms.

CHEVALIER JACKSON, Pittsburg, Pa. (*St. Louis Medical Review*, March 25, 1905). The first case was a child of nine years with no ear symptoms other than otorrhea one month prior to operation, when the attending physician was called to see the child in convulsions following vertigo, although there had been a chronic otorrhea from the left ear since typhoid fever, four years' previously.

There had been no chills, sweats or temperature exacerbations. The mastoid cortex was not perforated, but as soon as chiseled through foul pus was found in every direction. The inner table was eroded away over the vertical portion of the sigmoid sinus, the gap being crowded full of black, gangrenous-looking granulations, of foul odor, springing from the dura, which was dark crimson and fading to normal only when the sinus had been uncovered back to the torcular. After thorough cleansing of all the granulations and removal of soft bone the sinus was found soft and boggy at the knee and very firm, almost cordlike, below that point. The sinus was split open by an incision 3 c. m. in length. Firm, organized clot was found to have occluded the lower sigmoid and the jugular bulb, which seemed firm and healthy and was not disturbed. The lateral sinus was slit up backward until the curette could reach the torcular, and free bleeding followed. The sinus was packed with iodoform gauze.

The patient's condition was so very bad that it seemed unwise to exsect the jugular.

Except for marked amnesic aphasia, the after treatment was uneventful. Even this subsided at the end of a week. The wound healed quickly and recovery was complete.

While the writer obtained prompt and perfect recovery from septic sinus thrombosis after drainage, without jugular exsection, due to organization of the clot in the jugular bulb, he regards this as a very unsafe precedent to follow.

Case second was a man of 19 years, who had suffered with frequent earaches during childhood and otorrhea for intervals for three or four years past. The present illness began six weeks previous. He complained of pus from the left ear ten days before operation, nine days later dizziness, epileptiform seizures, nausea, vomiting and mastoid tenderness, for which the mastoid was opened and all pus and dead bone removed. The case did well for a week, when the symptoms again set in with greater violence, and it was found that some bone had died in every direction since the previous operation.

Second operation was done. Extensive area of dura bathed in the pus of an extradural abscess was exposed with accompanying area of pachymeningitis.

While the sinus contents appeared to be fluid on palpation, exploration was deemed warranted, and an incision 2 c. m. long, made from the knee downward, evacuated pus, fluid, lumpy and cheesy. In the direction of the jugular bulb the clot was broken down and foul. The internal jugular vein was then exsected through an incision in the neck below the auricle to the clavicle, all the branches being tied off. The sinus down to the bulb was safely curetted clean of pus and cheesy debris, and the other end of the sinus slit up far enough to allow the curette to reach to the torcular. The sinus was obliterated with iodoform gauze.

The after treatment was uneventful and recovery was complete in two months.

Microscopic examination of the exsected portion of the jugular vein showed the inner surface of the intima to be swarming with streptococci.

An interesting feature about this case was that the temperature was normal prior to operation. The writer regards exploration and the jugular exsection as harmless, provided the patient's condition be fairly good and not too profoundly poisoned with toxins.

The third case is reported as one with all the apparent symptoms of sinus trouble, in which, owing to the moribund condition of the patient, operation was not done, but in which the post-mortem showed the mastoid breaking down in pus, but the sinus to be absolutely normal.

Contrasting the normal sinus and absolutely typical sinus temperature with Case II., in which there was a sinus full of pus with absolutely normal temperature, the writer admits that all the diagnosis of which we are at present capable is as to whether exploration is justifiable or not. *Richards.*

Report of Two Fatal Cases of Brain Abscess.

EDWARD B. DENCH, New York City (*The American Journal of the Medical Sciences*, August, 1905). Case I., aged 52 years, presented the history of an acute middle ear inflammation with probable involvement of the mastoid at the time of the acute inflammation, but with apparent subsidence of all mastoid symptoms for a period of two weeks. He then came under observation with ill-defined cerebral symptoms, but with no evidences either of severe middle ear inflammation or of mastoid involvement. After four days' observation operation on the mastoid was performed as an exploratory measure, as there seemed to be no other reason for the irregular temperature elevation and a leukocytosis of 21,400. Rather extensive destruction was found in the mastoid, some free pus being present and granulation tissue. Increasing mental dullness led the author to do an exploratory craniotomy, the opening being made $1\frac{1}{4}$ inch above and $1\frac{1}{4}$ inch behind the center of the external auditory meatus, and an incision forward, downward and inward, extending to a depth of about an inch and a half into the brain substance, evacuated about an ounce of pus. The cavity was packed with sterile gauze, being previously examined through the encephaloscope.

Improvement lasted for four days, when the patient became dull, was aroused with difficulty. The abscess was dressed daily. From the fourth day until the ninth he became steadily worse, the temperature gradually rose, and he died on the tenth day after the operation with symptoms of meningitis.

Case II. A young man, aged 21 years, who was operated upon for a constant purulent discharge from the left ear, lasting for two years. After the ordinary conchal flap was cut, the posterior wound was packed with gauze and allowed to remain. Secondary skin grafting was done two weeks later, the granulations which had sprung up in the bony cavity being removed. Two large Thiersch grafts were applied to line the cavity, and the posterior wound completely closed by sutures. The temperature began to rise very soon after graft-

ing, and three days later the pledgets were removed and the grafts taken away. Four days after the temperature reached 105.6 and the wound was found to be infected. All stitches were removed and the wound irrigated freely with peroxide of hydrogen. At the time of the high temperature the blood count showed 25,000 white cells, 6,000,000 red cells, 81.5 per cent. polynuclear cells. Eye-grounds negative. Two weeks later, however, there was decided choking of the left optic disk, the patient was somewhat aphasic. The temporo-sphenoidal lobe was then explored by exploratory craniotomy and a large portion of the squamous bone removed. The dural flap was resected upward and several punctures made in the brain with negative results. Five days after the operation a small abscess formed under the anterior angle in the soft parts. Ten days thereafter, on opening the hernia cerebri, which was quite prominent, considerable pus was evacuated from the brain substance. These were packed with sterile gauze.

For the next six weeks there was steady improvement, with some slight temperature remissions, once reaching 104. Favorable symptoms continued until March 18 (the patient was originally admitted on December 5), when he complained of severe pain in the head, had a chill, became comatose, temperature rose to 105.8, neck became rigid and he presented all the evidences of meningitis. The brain substance was again opened over the region of the hernia cerebri and a considerable quantity of turbid fluid evacuated. This fluid evidently came from the lateral ventricle. Temperature fell to normal, but soon rose again. Death occurred on the seventh day after the invasion of the ventricle.

In commenting on these cases the author makes the point that in suspected brain abscess the opening into the cranial cavity should be made as nearly over the site of the collection of pus as possible so that the abscess may be drained through a minimum amount of healthy brain tissue. He thinks that a more exact knowledge of craniocerebral topography, with a closer study of the symptoms in each individual case, will enable us to more closely locate the situation of the abscess in the brain substance and materially improve our statistics.

Richards.

Conservative Treatment of Protracted Cases of Acute Otitis Media Purulenta, with Its Complications.

ALFRED WIENER (*New York Medical Record*, April 8, 1905) reports a number of cases with symptoms suggestive of the need of mastoid operation, which nevertheless got well under conservative treatment. He does not allow himself to be influenced by either the etiology or bacteriological findings, so far as operative procedures are concerned. While the presence of streptococcus undoubtedly means a severe infection, it does not necessarily mean immediate operation. Rigid cleansing, drainage and constitutional support are first demanded. Because a patient has been suffering from acute otitis media purulenta for two weeks and suddenly develops a temperature of 104 degrees, with mastoid symptoms and the presence of streptococcus, this alone would not persuade him to at once adopt radical measures. He would first of all employ conservative treatment, and if, within thirty-six hours, there was no decided improvement, he would then operate. In simple and acute cases with mastoid complications he prefers to wait from four to six days before advising operative interference.

He makes a very free incision of the drum membrane with a sickle-shaped knife and then inflates the ear forcibly with the Politzer method, and if this is unsatisfactory, uses either a Siegle speculum or a Delstanche instrument. As a drain, and at the same time to exert a beneficial influence upon the edema of the middle ear, he puts a strip of iodoform gauze wet in 10 per cent. Burrow solution, and over the entire ear and surrounding parts an occlusive wet dressing of the same solution. In rheumatic cases salol, iron and cod liver oil are used.

He does not claim that this treatment is so ideal that every case will respond to it, but thinks that we should hesitate before advising radical operative procedures until we have convinced ourselves that the symptoms present are urgent enough to warrant such interference.

The reviewer thinks that most otologists, in the presence of symptoms such as those described in the six cases reported, would feel safer in doing the regular mastoid operation than in trusting to more conservative treatment.

Richards.

**Orbital and Meningeal Infection from the Ethmoid Cells—Death—
Report of a Case.**

JAMES F. McCaw, Watertown, N. Y., (*The American Journal of the Medical Sciences*, August, 1905). The patient was a man forty years of age, who had been troubled with "catarrh" for ten years. The present illness began with what was supposed to be a head-cold, with swelling and edema at the upper and inner part of the left orbit, which quickly spread, involving both lids, conjunctiva and left side of nose, with great infiltration of the lids and orbital tissues. The temperature for a week ran from 100 to 103 with mental hebetude and mild stupor. When seen by the author there was a slight amount of swelling of the upper lid and chemosis of the conjunctiva of the left eye, sluggish reaction to light of the pupil, and on a line with and about an inch posterior to the external angular process of the temporal bone there was a smooth, rounded tumor about one and a half inch in diameter. Both nostrils contained polypi in the middle meatus, bathed in pus. The dead bone could not be detected in either nostril by the probe. Diagnosis of an intracranial involvement following an acute exacerbation of a chronic suppurative ethmoiditis, and the patient taken to the hospital, where an incision was made over the temporal region, and the subperiosteal collection of about two ounces of pus evacuated. The patient at this time was in a stupor with muttering delirium, subsultus tendinum, high temperature and pulse, involuntary urination, Cheyne-Stokes respiration, and death followed twenty-four hours later. After death the path of infection was found to have originated in the ethmoid cells, broken through the os planum, stripping the periosteum from the roof of the orbit, extending outward and downward to the external angular process of the temporal bone, and there passed out to form the subperiosteal collection of pus referred to. The orbital roof could be followed as far as the sphenoidal fissure, through which the infection probably entered the cranial cavity, apparently remaining subperiosteal throughout.

While fatal cases from suppurative sinusitis are rare, they are nevertheless to be considered as a possibility.

Richards.

Two Cases of Objective Aural Tinnitus Due to the Action of Tubo-Palatal Muscles.

WALTER A. WELLS, Washington, D. C. (*Journal American Medical Association*, January 21, 1905). Two cases of objectively perceived clicking are reported, representing, respectively, the involuntary and voluntary type, in each of which it was possible to make a very satisfactory examination of the mouth of the Eustachian tube during the production of the sound.

In the first instance a distinct clicking or snapping sound could be heard at a distance of about twelve inches from the ear, which was isochronous with the up-and-down movements of the larynx. The ear drums were a little retracted, but otherwise normal. The spasm consisted chiefly in a jerky, somewhat violent muscular movement of the muscles of the pharynx and palate, causing an approach toward the middle of the posterior pillars of the palate. The mouth of the Eustachian tubes was also involved in those movements in the sense that at each spasm the posterior lower lip moved forward and upward in such a way as to greatly narrow the opening of the tube.

This patient was 24 years of age. The condition had lasted for two years. The clickings occurred in quickly succeeding waves from ten to twenty at a time at the rate of about sixty a minute, and were more persistent when the patient was tired and exhausted, while during periods of quiet and restfulness they were nearly absent.

Case II. The movements in the throat were less manifest, consisting chiefly of a slight, jerky contraction of the posterior pillars. There was an upward and forward movement of the Eustachian tube. This sound could be produced by movement of the throat similar to that made in the act of yawning
Richards.

Notes on Otitic Epilepsy, with Report of a Case Relieved by Mastoid Exenteration.

B. ALEX. RANDALL, Philadelphia (*The American Journal of the Medical Sciences*, August, 1905). The case reported is one of the rare ones of apparently true epilepsy due to ear disease. The patient was a boy aged eight years, apparently in good health, who received a drenching by a hose with a penetration of water into the left ear in August, 1904, followed by

acute suppuration. As this slackened epileptiform attacks, sometimes four or five in a day, began about September 1. The attacks occurred almost daily, sometimes twice a day, with spells of unconsciousness, lasting about 60 seconds.

September 22 he was operated on by tympanic exenteration and the attic and antrum curetted smooth, the ossicles being markedly carious and the antrum filled with granulation tissue, but as there was no evidence of mastoid involvement, the operation was limited to the tympanum. The posterior wound did not heal well, and the epileptiform attacks continued once or more nearly every day. He was operated on again on December 1, when complete exenteration of the mastoid was done, finding unhealthy bone and granulations in the mastoid, but its inner depth apparently everywhere sound. The lateral sinus was laid bare, without finding granulations or pus in the sulcus, and the tegmen removed from the attic and antrum with like negative finding.

During the interval between the two operations the attacks had been more numerous than before, the minor tonic convulsions being reported as sometimes twenty in the night, as well as severe and repeated in the day. Following the second operation the attacks steadily diminished in severity, and on April 14 it was reported that the boy seemed entirely cured.

Richards.

**Report of a Case of Infective Sigmoid Sinus and Jugular Thrombosis
Complicated by Leptomeningitis—Lumbar Puncture—Sub-
dural Irrigation—Death.**

RICHARDS, New York (*Archives of Otology*, Vol. XXXIV., No. 3). In a boy age 6, the present illness is due to an acute process grafted upon an old chronic suppurative ear disease. A Stacke-Schwartz operation was performed. Through a pinhole perforation in the sinus groove immediately over the knee there issued, with each pulsation, a jet of thin fluid pus. The sinus groove was removed from a point beyond the knee to near the bulb and a moderate-sized perisinous epidural abscess evacuated. Granulations invested the sinus knee, the upper portion of the vertical limb of the sinus and the adjacent dura. The vein dimpled evenly in all directions, pulsated and was supposed to be normal. Temperature 99 4-5 degrees F. Four days later the temperature suddenly jumped to 104 degrees F., fell to 102 3-5 degrees F., then up again, reaching 105 degrees F. Stiffness of the neck and marked irritability indicated

meningeal invasion. The sinus was opened and found completely obstructed by a thrombus. The slit on the sinus wall was extended out on the lateral sinus beyond the thrombotic involvement. Jugular resection was made, then the clot removed from the bulb. A free return flow from below evidently came from the condylars, the inferior petrosal sinus or from both.

As there was no improvement, lumbar puncture was made. The turbid fluid withdrawn showed streptococci in abundance, pus cells and diplococcus. Following lumbar puncture the temperature fell 4 degrees, remained at 100.3-5 degrees F. for 14 hours, when it again jumped to 105 degrees F. A second lumbar puncture and an attempt to irrigate the subdural space proved futile. A few days later the child died, presenting the symptom-complex of a general cerebrospinal leptomeningitis.

Campbell.

A Report of Two Cases of Acute Otitis Media Suppurativa Followed by Mastoiditis and Meningitis and Caused by the Diplococcus Intracellularis of Weichselbaum.

BACON, New York (*Archives of Otolaryngology*, Vol. XXXIV, No. 3). These cases emphasize the great value of making a bacteriological examination of the pus in every case of middle ear suppuration.

The first case started in with what appeared to be a severe attack of influenza. The middle ear on each side became affected and the disease spread to the mastoid cells. The bacteriological report at the time was that the organism resembled very closely the gonococcus, but very probably was the diplococcus intracellularis. The temperature chart suggested the possibility of a septic thrombus, but with a temperature of 103.8 degrees F. the pulse was 98 and respirations 12, and next day, with a temperature of 102.4 degrees, the pulse was 94 and respirations 8. Improvement after operation was due probably to relief of intracranial pressure by the copious bleeding. Recovery took place in this patient.

The second case had meningitis when admitted to the hospital. When the dura was exposed in the temporo-sphenoidal region it was found much thickened and covered by granulations. Pus from the external auditory meati contained pneumococci and the diplococcus intracellularis meningitidis of Weichselbaum. The patient was dull and apathetic after the operation. She became comatose, hypostatic pneumonia developed and death supervened.

Campbell.

A Case of Bacillus Pyocyaneus Pyemia Following Ear Disease.

DR. T. J. HORDER, (*Pathological Society*, London, April, 1904), describes a case of bacillus pyocyaneus pyemia following ear disease. The bacillus pyocyaneus might be pathogenic to man as the partial or sole cause of abscesses, as setting up a form of dysentery, or as (rarely) causing a general infection. The case recorded was one of these last. The patient was a man suffering from otitis media of long duration. He was admitted to hospital for fever, severe headache and delirium. Diarrhea set in a week later. There were no signs of cerebral disease. Widal's test was twice negative, and there was a leucocytosis of 32,000. Emaciation was very marked. The fever was not high, but was continued in type. During the fifth week of the patient's illness paraplegia appeared. Death occurred at the end of this week. At the post-mortem examination the brain and the membranes were natural. Green pus was found in both middle ears, in several abscesses in the lungs, and in a large abscess of the spinal meninges. From this pus the bacillus pyocyaneus was grown in pure culture, pathogenic to animals giving the usual cultural reactions of this organism. Dr. W. Bulloch said that it was possible that the general infection might have taken place after death from from the point of infection in the ears. He had frequently seen spastic paraplegia come on in the course of bacillus pyocyaneus poisoning, but he had no explanation of the disease. It was extraordinary that the bacillus pyocynaenus was not more pathogenic to man, as it was so markedly pathogenic to animals. Mr. L. S. Dudgeon said that he had seen two cases of bacillus pyocyaneus infection; in one of the cases he had been able to find the organism in the blood during life.

Wyllatt Wingrave.

The Value of the Present Quantitative Tests for Hearing, with the Demonstration of a New Apparatus.

SOHIER BRYANT (*New York Medical Record*, April 1, 1905). Feeling that up to the present time we have had no ideal method of testing the hearing, inasmuch as what the patient desires to hear is the human voice, and not the tick of a watch, the click of an acoumeter or the note of a tuning fork, the author began experimenting with the phonograph, and after some trouble managed to get cylinders which were of practical use, and which allow the operator to determine accurately the

limit at which the patient is able to hear with sufficient distinctness, so as to repeat the words spoken by the machine.

He claims that this phonographic acoumeter furnishes a test for the human voice which does not vary, and can be employed and repeated indefinitely. It furnishes a sure way of detecting feigned deafness short of total bilateral deafness. Monosyllables are preferred to longer words, as polysyllables gave the patient an opportunity to guess the sounds not distinctly heard.

Unfortunately he gives us no idea either as to the maker or the cost of this apparatus. *Richards.*

Two Anatomic Anomalies Encountered in Living Subjects During the Performance of Mastoid Operations.

BRAISLIN, Brooklyn (*Archives of Otology*, Vol. XXXIV, No. 3). I. Hiatus of large size in the cortex of the mastoid, opening directly into the mastoid cells.

This fissure three-quarters of an inch long by a quarter broad, lay in the line of the masto-squamosal suture. The first attack of mastoid inflammation gave rise to early involvement of the cervical lymphatics, so extensive as to require their thorough removal.

The present attack presented gradually increasing pain, and a septic temperature out of proportion to the disclosed mastoid disease. This could be attributed to the absence of the cervical glands.

II. Unusual depth of the supra-meatal depression in the triangle of Macewen.

In this case a depression five-eighths of an inch deep was disclosed. It stopped short of the mastoid antrum.

Campbell.

A Case of Mastoiditis in an Infant of one and a half years, with a Sequestrum Consisting of a Large Segment of the Petrous Portion of the Right Temporal Bone—Removal of the Sequestrum and Stapes—Recovery.

BRAISLIN, Brooklyn (*Archives of Otology*, Vol. XXXIV, No. 3). In an emaciated, marasmatic infant through whose auditory canal a loose sequestrum was detected by a probe, exuberant granulations filled the tympanum. The author removed, without anesthesia a large sequestrum, pyramidal in shape, with its base representing the outer cortex of the mastoid and apex containing about one-quarter (the upper and

posterior segment) of the annulus tympanicus. It represents the entire bony framework between the auditory canal and tympanic cavity below and the dura above. A week later the whole stapes was easily removed from amidst a mass of granulations.

Campbell.

The Importance of an Early Aural Examination in Acute Diseases of Children.

JAMES F. MCKERNON, New York City (*Journal American Medical Association*, January 7, 1905). The author thinks that it is just as important that children suffering from the acute exanthemata have their ears examined every day as it is that they be seen for their general condition, since the mortality from this disease is quite as large from the aural complications as from any other. Many cases of deaf mutism, as well as the legion of chronic purulent ears, with their sequelæ, might be avoided if this precaution were taken. It should be done as a routine measure, since in a large number of the cases there is no symptom pointing to an aural condition until after the damage has occurred.

Richards.

Some Mooted Points in the Treatment of Protracted Cases of Acute Middle-Ear Diseases and their Complications.

WIENER, New York (*Archives of Otology*, Vol. XXXIV., No. 3). The author is an advocate of ultra-conservatism, and for such makes a bad showing, viz., forty-two cases of acute otitis media with four mastoid operations and one death.

The author claims that it is unwise to operate before pus accumulates throughout the mastoid structures, because if operated on earlier they do not heal so readily. This is surely bad practice to allow infectious matter to remain in the mastoid, and there are no reliable reports of mischief done by early operation.

Campbell.

Protruding Auricles Treated by Operation.

T. G. OUSTON (*British Medical Journal*, July 4, 1903). The method consisted in removing skin and cartilage from an area of the posterior surface of the auricle and stitching it to a corresponding denuded area over the mastoid.

Wyatt Wingrave.

A New Method of Treating Suppurating Catarrh of the Middle-Ear.

A. GRAY (*Lancet*, April 18, 1903) used a saturated solution of iodoform in anilin (1 to 1), applied (after syringing) on cotton wool mops, care to be employed in drying surfaces to be treated. Particularly useful in tubercular cases.

Wyatt Wingrave.

Otolith of Ext. Auditory Meatus.

GODWIN, (*Brit. Med. Journal*, Mar. 4, 1905). Female aet. 30, deafness and tinnitus since childhood. Meatus blocked with hard substance. Extracted with forceps. Consisted of wax mixed with epithelium and calcium phosphate. Weight $4\frac{1}{2}$ grains.

Wyatt Wingrave.

Pyemia Due to Bacillus Pyocyaneus in a Patient Suffering with Chronic Suppuration of the Middle-Ear.

HORDER, (*Lancet*, April 23, 1904). (Pathol. Soc., Lond.) Patient died after 5 weeks general pyemia, green pus being found in both ears, lungs and spinal meninges, affording pure cultures of B. Pyocyaneus.

Wyatt Wingrave.

Labyrinth Caries—Vertigo—Operation—Recovery.

CUMBERBOTCH (*Lancet*, June 4, 1904). Woman, aet. 22, suffered with chronic suppuration middle ear. Radical mastoid was done 12 months later. She suffered extremely with vertigo. Wound reopened, carious labyrinth removed. Recovery with freedom from vertigo.

Wyatt Wingrave.

II.—NOSE AND ACCESSORY CAVITIES.**The Operative Treatment of Chronic Suppuration of the Frontal Sinus.**

A. LOGAN TURNER, Edinburgh (*Transactions Section on Laryngology and Otology, American Medical Association*, 1904). The symptoms which would make surgical interference imperative are those suggesting cerebral complication: pain, usually of the nature of headache, which may be very severe and persistent, the distension of one of the bony walls of the cavity or the presence of a fistula discharging externally, disturbance of the general bodily health by the continued suppuration and general mental depression. Evidence as to the amount of intracranial complications which follow empyema of the

frontal sinus is up to the present time rather meagre. The author has found in literature, including his own cases, forty-two instances of intra-cranial complication associated with supuration of the frontal sinus.

He thinks the number of cases in which intra-nasal treatment absolutely cures must be very small, although some of the more aggravated symptoms are relieved and the state of the patient may become more satisfactory when the intra-nasal condition is carefully attended to.

As to what operative procedure is to be adopted, there are two main principles. First, the sinus is opened and drained into the nose with preservation of its cavity. Or, secondly, the sinus is obliterated by the removal of one or more of its bony walls, and there is no longer any cavity with which to deal. In the first instance there is always a sinus remaining which may subsequently become the seat of fresh infection. In the second there is a varying amount of disfigurement, a matter of considerable moment in this part of the body, and which may assume considerable proportion. What is desired is some method by which we may best obliterate the cavity and produce the minimum of disfigurement. The Ogston-Luc operation, which consists in opening the frontal sinus through its anterior wall, careful curetting of its interior and establishing a large communication between the sinus and the nose, and at the same time destroying the anterior ethmoidal cells in the region of the naso-frontal duct, with closure immediately or soon after the external wound is first considered. This has been the operation most usually performed, but the author thinks the results which have followed it have been far from satisfactory. Of 55 cases he found 32 cures and 23 failures; that is to say, a percentage of 58 successful operations, and is to be chosen for comparatively recent cases in which the dimensions of the sinus are limited and the fronto-nasal canal roomy and the ethmoidal labyrinth free from suppuration.

Statistically the results from the obliteration method, the method in main being that described by Kuhnt, are that of 67 cases a cure was effected in all but one.

The mortality after operations has been considerable, Professor Turner having collected 24 in which death followed operation on the frontal sinus. Of the fatal cases the clinical picture has been in the main similar, infection occurring within two or three days of the operation, the diploe of the frontai

bone being invaded by organisms and an osteomyelitis set up. The infection then spreads and is followed by abscess, subperiosteal, extradural or subdural, with general meningitis or cerebral abscess or general septicemia or pyemia, followed by death. Of 24 of the fatal cases 17, or 74 per cent., occurred after opening and draining the sinus (Ogston-Luc). In 15 death followed a single operation, while in 2 more than one operation had been performed owing to the failure of the first to effect a cure. These followed after an operation for obliteration of the sinus. There were more fatalities following secondary operation than primary, since the presence of a discharging fistula in the forehead, as the result of failure to cure a sinus suppuration, places the patient in less satisfactory condition for further interference than if the skin were unbroken. Professor Turner is of the opinion that in the fatal cases the involvement is due to the fact that foci of septic material are left which may contaminate the newly exposed bone in the neighborhood. He asks the question whether the statistics show that the mortality in the last two or three years has diminished as the result of riper experience, and while answering the question in the affirmative, states that of the fatal 24 cases no fewer than 9 have occurred during the last two years. He is in the habit during the operation of using small flushing spoons while removing the diseased mucous membrane, thus keeping a stream of warm saline solution or boric acid solution constantly playing on the bone. In this way he attempts to remove all septic material at once from the wound, thus lessening the risk of further spread.

The osteoplastic operation is mentioned. The cosmetic results are good, but as the sinus is not obliterated, there still remains the possibility of reinfection.

The operation of Killian is next considered. In this operation the anterior and inferior bony walls of the sinus are resected, the ascending or frontal part of the superior maxilla is removed, and a large opening of communication thus made between the frontal sinus and the nasal cavity so that good drainage through the nose can be established. To reduce to a minimum the deformity which may follow so extensive a dissection, the supraorbital bony margin is preserved as a bridge between the gap formed by the removal of the anterior sinus wall on the one hand and the floor on the other. The results as to cure following this operation have been satisfactory,

and the final cosmetic appearances have proved to be encouraging. As the supraorbital margin is left, the contour of the eyebrow is preserved and the depression which attends the removal of the walls of the sinus is thus minimized. The orbital tissues take a considerable share in the filling of the sinus area, so that the sinking in of the soft parts covering the vertical portion of the sinus is thereby reduced, the orbital fat rising up into the horizontal part of the cavity to considerable extent on removal of the bony floor of the sinus.

Should the cavity be deep there is some degree of flattening above the supraorbital margin which may be diminished somewhat by bevelling the cut edge of the anterior wall of the upper margin of the sinus. Should the operation be performed on both frontal sinuses the septum between the two is removed. The eye should be handled as little as possible, and any undue pressure on it avoided.

Professor Turner's one criticism of the operation is that the cavity is not completely obliterated, as a space remains behind the inner end of the bridge which continues to secrete and discharge a certain quantity of pus until a new lining membrane growing upward from the nasal cavity has completely covered the granulations. This may prolong the healing process two to three or more months.

He does not think that there is any single method of procedure applicable to chronic suppuration in the frontal sinus. In the absence of ethmoidal disease and with a small sinus simple opening and draining by the Ogston-Luc method may prove satisfactory. In every other class of cases he would recommend the principle of obliteration of the sinus, and feels that should more extended experience show that the operation suggested by Kilian provides satisfactory curative results with less disfigurement than other radical methods, then we probably have at our command an operative procedure which will take the first place.

Richards.

Rhinoscleroma.

MAX TOEPLITZ and HENRY KREUDER, New York City, (*American Journal of the Medical Sciences*, July, 1905.) Rhinoscleroma has been thought to be a curiosity, but of late seems to lose more and more its endemic character and to spread. About 600 cases are known to exist. The principal seat is the western part of Poland, particularly Galicia. The two cases reported are from Galicia.

The first in a woman 25 years old. Had a tumor simultaneously in the mouth and in the nose, which latter had been obstructed for three years.

The second case was 27 years of age. Had suffered for twelve years from permanent headaches and for eight years with impaired nasal breathing. The outer nose was not changed, the nasal entrances were widened, more roundish, the alae nasi pushed outward and the entire cartilaginous nose was knobiike and thickened. The left nostril was entirely obstructed by a swelling broadly attached to the alae nasi and the nasal floor. It was whitish-gray and hard. Its extension backward could not be followed. The right nostril was narrowed by infiltrated folds, which still left room for breathing. In the naso-pharynx there was a roundish, somewhat nodular swelling at the right near the center, close to the pharyngeal surface of the velum. The uvula was missing, and at its former place the velum was irregularly thickened by nodules.

A detailed histological and bacteriological description is given by Dr. Kreuder.

Rhinoscleroma begins in the posterior nares in the form of granulomatous proliferations upon the surface of the mucous membranes, or as diffuse infiltrations of the submucous tissue. These proliferations consist of nodules associated with infiltrations of the subepithelial layer. The blood vessels obliterate and are transformed into bundles of connective tissue; the nodules shrink and the proliferations become contracted, hardened and firmly attached to the underlying tissues. The process propagates diffusely and slowly around the posterior nares, the nasal cavity and vestibule and naso-pharynx.

Dr. Kreuder was able to demonstrate a bacillus morphologically like the bacillus of Friedlander except that the scleroma bacillus is positive to Gram's stain, while the Friedlander bacillus is negative.

Richards.

The Inferior Turbinated Bone: Its Function, Diseases and Treatment..

WENDELL C. PHILLIPS, New York City (*The American Journal of the Medical Sciences*, July, 1905). Hypertrophy and deformities of the inferior turbinate may interfere with nasal respiration, with drainage, give rise to pressure symptoms and subsequently to mental depression, and prevent proper intra-nasal hygiene. This hypertrophy should not be confounded

with congestion or inflammation. When the symptoms and appearances indicate pressure, altered secretion, interference with drainage and the function of the nose the hypertrophic tissue and portions of the bone should be removed. To do this escharotics should never be employed, such as chromic acid and the like, and the galvano-cautery is of doubtful efficiency.

The best method of operation for anterior hypertrophy is by clean-cut means of specially devised scissors through both soft tissue and bone, while the cold wire snare, consuming from a half hour to an hour in cutting through the growth, offers the best method for the removal of posterior hypertrophies.

The author has had the best of results after operation with the use of 12 per cent. solution of acetotartrate of aluminum, to which may be added a few drops of weak adrenalin solution as an application to the wound. A very thin piece of absorbent cotton is saturated in this solution and then laid against the wound. The nostril is not plugged, and the disinfectant properties of the acetotartrate of aluminum render it safe to leave in situ for several days. He has made use of this method for several years, and has never had a case of secondary hemorrhage or infection after its use. *Richards.*

Glioma of the Nose—Report of Two Congenital Cases.

J. PAYSON CLARK, Boston, Mass. (*The American Journal of the Medical Sciences*, May, 1905). Outside of the brain and spinal cord true glioma is very rare.

The author's first case was a boy of 2 years, who had a rounded tumor of the nose about the size of a robin's egg, which had existed from birth, and caused considerable deformity. It was soft to the touch and resembled very strongly in appearance and consistency a fatty tumor. The situation was in the front of the nose. On looking into the nose the left nostril was almost completely obliterated by a pinkish-gray polypoid growth, which had connection with the external tumor. A piece of this, on being removed, was found to be a glioma. The tumor was afterwards removed, with no tendency to new growth.

The second case was observed in a child of 10 weeks, a pinkish-looking polypoid mass obstructing the left vestibule, the site of which was higher up in the nose and appeared to be from the septum. On removal the hemorrhage was free, but easily

stopped. Microscopic examination showed the tissue to be gliomatus in character, the tissue consisting of cells and fibrils in varying proportions. Some of these were quite large, with eccentric nuclei and fibrillary processes. This growth also showed no tendency to recur. The case was under observation for a year.

The author searched the medical literature of more than ten years past, but could find no more reported cases of glioma of the nose.

Richards.

The Treatment of Chronic Nasal Catarrhs with Sulphur.

LOUIS KOLIPINSKI, Washington, D. C. (*Medical News*, August 12, 1905). The official sulphur praecipitatum U. S. P. is the form of sulphur used, and the author has had good results with it when administered by insufflation. He uses it in plegmonous, simple chronic nasopharyngitis, hyperplastic nasopharyngitis without organic obstructions the fullness and post-nasal dryness, the post-nasal dropping and incrustation, the hawking, expectorating and vomiting cease. In simple chronic rhinitis, hypertrophic stage, the nasal discharge is diminished, the mucopurulent and purulent exudate becomes clear and much less, the intermittent nasal occlusion ceases, the dull frontal headache is gone, the manner brightens, the itching of the nose, sneezing and cough abate. The diffusely swollen deep red membrane diminishes in size and lightens in color.

The method of using it is as follows: The anterior nasal cavity is exposed with a speculum, the tip of the nose elevated and the sulphur freely and thoroughly blown in with a strong powder blower. This has been properly done when the powder appears from the mouth and opposite nostril and an irritating cough results.

Richards.

The Radical Operation for Empyema of the Frontal Sinus.

W. FREUDENTHAL, New York City (*Journal American Medical Association*, February, 1905). The author thinks that conservative methods should be tried up to the point where they cease to be feasible, but that when we have to operate, Kilian's method is the one which seems at present to give the best results.

The first opening into the frontal sinus should always be made below the outlined bridge, and only after exploring the sinus should another above it be made. In one of the author's

cases he found the dura matter presented itself after cutting away the bone immediately above the bony bridge. As the external wound is closed immediately after the operation, he has found the cosmetic results to be good.

A number of case histories are given in detail.

Richards.

Sarcoma of the Vomer, with Extensive Involvement of the Adjacent Structures and Metastasis in the Cranium.

ARTHUR P. HERRING, Baltimore, Md., (*The American Journal of the Medical Sciences*, August, 1905). The patient was seventeen years old. First sought relief in March, 1904, on account of an injury to the right side of the head occurring in December, 1903. At that time the cervical glands were removed and were said to be tuberculous.

First seen by the author in June, 1904, at which time there was a small vascular tumor attached to the vomer in the right nostril, extending about half way across the posterior nares, without involvement of the pharyngeal wall. This increased rapidly, invaded the naso-pharynx, occluded the posterior nares, and in September there was pronounced bulging of the right cheek, depression of the soft palate and complete filling of the naso-pharynx. Complete occlusion of the right nostril.

October 20th the upper jaw was resected but the patient did not survive the operation, living only six hours. Post mortem examination showed extensive involvement of the centers of the anterior bony areas of the floor of the brain, showing direct growth of the tumor from the nose. The character of the growth was that of a spindle-cell sarcoma.

Richards.

The Treatment of Chronic Empyema of the Antrum, Both Simple and When Combined with Empyema of the Ethmoid and Sphenoid.

R. BISHOP CANFIELD (*Ann Arbor, Mich. Medical News*, March 25, 1905). Cases of dental origin should, after extraction of the tooth and the removal of any carious material, be treated as though the disease had arisen intranasally. For reaching the antrum he considers the inferior meatus as the easiest place of access and the one usually to be chosen, free approach to the lateral wall of the nose being secured by removing the inferior edge of the inferior turbinate and the antrum broken into by means of a drill, mallet or chisel, three-

quarters of an inch by one inch in diameter. The electric drill is to be preferred, as most instruments splinter the bone badly, leaving the edges of the wound rough and irregular and often forcing pieces of bone into the antrum.

If the case cannot be cured by cleansing and other measures introduced through such an opening, the more radical so-called Luc-Caldwell operation must be done. *Richards.*

The Correction of Nasal Deformities by Subcutaneous Operations.

JOHN O. ROE, Rochester, N. Y., (*The Medical Record*, July 1, 1905). Dr. Roe reports a number of cases of extreme nasal deformity in which good results were obtained by one or more subcutaneous operations with the aid of plastic surgery, the required parts being taken from the lips and adjacent regions. As facial deformity powerfully affects the mind, it is one of the important duties and privileges of the rhinologist to do what he can to correct these deformities.

Deformities are corrected for the most part from within the nose, one of the first essentials being to separate the attachment of the skin and periosteum from the nasal bones and then make the correction in accordance with the needs of the individual case, afterwards fitting a suitable splint of the desired shape and size made to fit the nose after the deformity is corrected and held in place by adhesive plaster across the face. *Richards.*

Observations on the Therapeutic Value of Medicated Ointments in Certain Affections of the Nasal Chambers.

ALEXANDER W. MACCOY, Philadelphia, (*Laryngoscope*, February, 1905). The author has largely substituted the use of ointments for nasal washes, sprays and powders, and has found relapses much less frequent in cases of patients undergoing treatment for chronic conditions. The ointments are given to the patient in collapsible tubes as a protection from contamination, and since this form of dispensing renders them most convenient for use at all times and places. He thinks our constant and persistent use of nasal washes, especially during the winter season in our climate, tends to harmful results. The same class of medicines are used as are generally employed in washes, vapors and powder, the difference shown being in their enhanced value in effecting desired results.

He has found quinin especially useful in ointment form in

case of chronic rhinitis and in the edematous condition present in vaso-motor cases. The ordinary vaseline ointment is too thick and firm for use, one to two drams of the fluid vaseline being require to each ounce of the ointment.

Richards.

Naso-Fibroma Treated by Injections of Monochloracetic Acid.

HARMON SMITH, New York, (*Laryngoscope*, April, 1905). The fibroma was in the right naris, entirely occluding it, in a boy of sixteen. Attempts to remove the growth having failed, fourteen injections of from three to five minims of monochloracetic acid at intervals varying from three weeks to two months were made into the tumor. Nothing now remains of the tumor but a fibrous curtain covering the entire post-nasal space. The boy gained fifteen pounds in weight.

In using monochloracetic acid care should be taken that all of the acid is inside the tumor and does not get into the larynx. This happened to the author on one occasion and produced a laryngeal spasm and pain on swallowing of such intensity that the patient ate nothing for three days.

Richards.

Modern Methods of Accessory Sinus Treatment.

H. HOLBROOK CURTIS, N. Y., (*Laryngoscope*, May, 1905). **The Antrum of Highmore; the Removal of the Greater Part of Its Inner Wall Through the Nostril for Empyema.**

OTTO T. FREER, Chicago (*Laryngoscope*, May, 1905).

Both Dr. Curtis and Dr. Freer advocate the treatment of empyemata of the antrum through the nose by the removal of a greater or less portion as may be necessary of the naso-antral wall, together with the anterior portion of the inferior turbinate. In many cases they think that this operation will produce as satisfactory results as the more radical one through the canine fossa, and is very much more satisfactory to the patient than openings made through the tooth sockets.

Richards.

Adeno-Carcinoma of the Nose.—Killian Operation for Radical Removal.

JOHN MCCOY, New York, (*Laryngoscope*, April, 1905). The patient, 47 years old, printer, had an adenocarcinoma obstructing the right nostril and extending up into the frontal sinus, which was removed by the Killian method of operation

on the frontal sinus with good results. Six weeks after the operation the frontal sinus was obliterated, filled with healthy granulation tissue, and there was no signs of recurrence. The cosmetic result was good, as it was not apparent to the casual observer that any operation had been done. *Richards.*

Turbinectomy.

D. S. REYNOLDS, Louisville, Ky., (*Laryngoscope*, April, 1905). Reynolds removes the inferior turbinate with a saw and then introduces a pack against the site of the removed portion. He has never known occlusion of the inferior extremity of the lachrymal duct to follow the operation.

He does not think that septal ridges and spurs are attended by any inconvenience to the patient unless they create obstruction to the free passage of air through the nose.

Richards.

Inspection of the Antrum of Highmore.

KELLY, (*Lancet*, Sept. 17, 1904), advocates ocular inspection by means of a large speculum similar to aural, through an opening in canine fossa made by trocoa. He discusses the various morbid conditions suitable to the method.

Wyatt Wingrave.

III.—PHARYNX.

On Pneumococcal Sore-Throat with Notes of a Fatal Case.

W. PASTEUR, (*Lancet*, May 27, 1905). Among the acute inflammations of the faucial region there is one, pneumococcal angina, which has not apparently as yet received in this country the attention it deserves. At a recent public examination not a single candidate even mentioned this condition in discussing the differential diagnosis of diphtheria. Pneumococcal inflammations of the fauces and larynx are, however, well worthy of attention on account of the close clinical resemblance they may present to other acute inflammations of those regions, especially diphtheria.

The occurrence of inflammatory lesions of various mucous membranes, with or without membranous exudation, in association with pneumonia and broncho-pneumonia, has been recognized for many years. A very remarkable case of this kind is recorded by Cary and Lyon. But examples of primary inflammation of the faucial region are much more uncommon.

Jaccoud, T. K. Monro and others have placed on record cases of membranous sore throat of pneumococcal origin which clinically were very like diphtheria. The appearances in the case about to be related differ widely from these and afford a good example of another variety of pneumococcal pharyngitis, the "angine erythémateuse pneumococcique" of French authors.

Referring to the probable frequency of acute membranous tonsillitis and pharyngitis of pneumococcal origin, Foulerton remarks that "the exact bacteriological identification in these cases is rendered difficult by the fact that the organism is a frequent parasite of the healthy mouth. But the number of cases in which there are the formation of a false membrane and destruction of the superficial layer of the epithelial membrane associated with the presence of the coccus in predominant numbers and without any of the other bacteria—*B. diphtheriae*, *streptococcus pyogenes* and *saccharomyces albicans*—which are known to cause similar lesions, leaves little doubt as to the fairly frequent occurrence of an acute membranous pharyngitis due to this cause."

A healthy, well-nourished boy, aged three and a half years, was seized with sudden illness on October 24th, 1903. The prominent symptoms were sore throat with great pain on deglutition and high fever, which had persisted. There was no initial vomiting nor had there been any signs of laryngeal implication or of pulmonary trouble. He had only taken small quantities of milk with much difficulty. He was admitted to the Middlesex Hospital on the fourth day of illness in the following condition: The face was pale with a dusky malar flush. The respirations (40 per minute) were not labored. The pulse (120) was soft, full and regular. The glands at the angle of the jaw were moderately swollen on both sides and very tender. skin was dry and hot (temperature, 103 degrees F.). There were no signs of desquamation and no puffiness. There was no discharge from the nose or ears. A careful examination of the heart and lungs revealed no abnormal signs. A specimen of urine passed soon after admission gave a positive result to Ehrlich's diazo reaction; it was free from albumin. The uvula, soft palate and faucial pillars on both sides were slightly edematous and intensely red and glazed. Both tonsils were somewhat swollen and intensely injected. There were no exudations of any kind, and no plugging of the follicles of the tonsils. The posterior wall of the pharynx could not be seen.

The tongue was rather thickly furred and the breath was very offensive.

Progress of case.—6,000 normal units of diphtheria anti-toxin were injected on admission and a swab was taken from the throat for bacteriological examination. The temperature ranged high throughout the illness, exceeding 103 degrees every day, and only once falling as low as 101 degrees. On November 7th the appearance the throat was much the same. There were no signs of exudation. The patient had great difficulty in swallowing and frequent regurgitation of fluid through the nose. The enlarged spleen could be felt below the ribs, but it was not tender. The swab cultures yielded an abundance of micrococci, but no bacilli were present. Widal's reaction gave a negative result. No signs of broncho-pneumonia were present. There were considerable enlargement and much tenderness of the glands at the angles of the jaw. On the 10th, attempts to feed through a nasal tube failed; nutrient enemata of milk and beef tea had been given since the 8th. On the 11th there were signs of cerebral irritation. The child was curled up to one side with the wrist flexed and the knees bent up. He strongly resented all interference, cried out at sudden noises, and had definite photophobia. No paralytic symptoms were observed. During the last two days the fetor of the breath had increased and become distinctly gangrenous. On the 9th the throat was still intensely red and glistening, but today (11th) the whole of the uvula and the adjacent portions of the soft palate were brown and sloughing. There were no signs of peeling and the urine remained free from albumin. The nutrient enemata were omitted on account of rectal intolerance. On the 14th the temperature had been more remittent since the 11th, and the patient was growing rapidly weaker. The throat was sprayed frequently with chlorine water, but without appreciable effect on the fetor and unsuccessful attempts had been made to irrigate the nasopharynx with antiseptics. There was now a gray gangrenous slough involving the uvula and the palatal arches. The respirations had risen from 30 to over 50 per minute and signs of broncho-pneumonia had made their appearance in the left lung, both in the upper and lower lobes. Death took place on November 15th, the twenty-second day of illness. There was slight diarrhea during the last three days. There was no nasal discharge at any time.

Necropsy.—A post-mortem examination was made 31 hours after death, the weather being cold. The body was emaciated and somewhat rachitic. No beading of ribs could be seen. There was some excoriation at the right angle of the mouth. The whole of the soft palate, both pillar of the fauces, and the tonsils formed a large greenish gangrenous mass. The glotto-epilottic fold and pyriform sinuses were also discolored and bathed by a thin greenish purulent discharge. The sloughing area reached as far forwards as the hard plate. The glands at the angle of the jaw and those of the posterior triangles were much enlarged. The right pleura contained two and a half ounces of thin reddish pus. On the posterior aspect of the left pleura, just on a level with the bifurcation of the trachea, was a circular patch of softening. The esophageal, bronchial and mediastinal glands were enlarged. The bronchi were congested and contained some thick purulent exudation. The upper lobe of the left lung was congested. There was one small gangrenous patch on the posterior aspect. The lower lobe was riddled with patches of broncho-pneumonia which were becoming gangrenous. The largest gangrenous cavity was of the size of a hazel nut. There were similar changes in the right lung. A gangrenous patch of the size of a walnut was in the upper lobe, and there were areas of collapse in the lower lobe. The heart was natural. The stomach was contracted and healthy. The esophagus was healthy. The kidneys were somewhat enlarged and cloudy. There was cloudy swelling and much post-mortem discoloration in the liver. The spleen was enlarged and congested. As regards the head, the scalp, calvaria and sinuses were natural. There was slight congestion of the pia-arachnoid and some excess of cerebro-spinal fluid. No meningitis was present. The brain substance was natural.

Bacteriology.—Cultures obtained post-mortem from the pharynx and lungs were examined by Mr. A. G. R. Fullerton, who informed me that the diplococcus pneumoniae was present in predominating numbers, together with a bacillus (probably the result of post-mortem inflection) in smaller quantity. The diplococcus was tested on a mouse and found to be of normal pathogenicity for that animal.

The difficulties surrounding the clinical diagnosis in this case were very great. The child was too young and too desperately ill to permit of any really satisfactory examination of the nasopharynx being made. Diphtheria antitoxin was injected as a

precautionary measure only, for the sudden onset, severe initial symptoms and persistent high temperature did not lend support to this view of the case. The absence of all exudation on the tonsils and fauces and the total absence of any signs of desquamation excluded the diagnosis of scarlet fever. On the whole, the appearance of the fauces and soft palate on admission more nearly resembled erysipelas than anything else, but the very moderate degree of edema militated strongly against this view. The possibility of a pneumococcal inflammation of the pharynx was carefully considered but could hardly be maintained in the face of the negative result of the first bacteriological examination. I am satisfied that the pharynx was the site of primary infection. The lungs were repeatedly examined and no signs of broncho-pneumonia or other lesion detected until the later stages of the illness, when gangrene of the palate was already well marked.

The occurrence of gangrene in pneumococcal inflammations of mucous membranes is well established. Munro's patient recovered with a perforation of the faucial pillars, and I may fitly refer here to a remarkable case which came under my notice some time ago and was placed on record by Foulerton. The patient, aged 26 years, had suffered from a "quinsy" a fortnight before admission to the Middlesex Hospital, and had been ill ever since. He died from pyemia three days after admission. The necropsy revealed an almost universal pneumococcic gastritis, with extensive necrosis of the glandular layer of the mucous membrane of the stomach. There was a deepish ragged ulcer in the right tonsil. It seems probable that in this case the primary lesion was a pneumococcic infection of the right tonsil, though this was not proved bacteriologically.

Dr. J. Kingston Fowler had a case of membranous laryngitis arising in connection with an acute pneumococcal inflammation of the lungs. The patient, a man, aged 38 years, was admitted in the fourth week of an acute illness with signs of consolidation in the left lung. He lived for 34 days after admission, during which period the greater part of both lungs became consolidated. The necropsy revealed a very extensive pneumonia of both lungs, with a small smooth-walled gangrenous cavity at the posterior apex of the left lower lobe. There was a patch of toughish adherent membrane on one of the vocal cords from which Mr. Fullerton obtained a pure culture of

diplococcus pneumoniae. This organism was also present in preponderating numbers in the cultures obtained from scrapings of the lung tissue just outside the cavity in the left lung. The patient had not presented any laryngeal symptoms.

A striking example of pneumococcal laryngitis has been recorded by Seuvre. The case is that of a boy, aged 8 years, in whom symptoms of laryngeal obstruction supervened in the course of an attack of "grippe." Tracheotomy had to be performed and pneumococcus in pure culture was obtained from pieces of membrane coughed up through the tracheotomy tube. It is clear from a consideration of recorded cases that pneumococcal pharyngitis may present different clinical forms. French observers who have paid some attention to the subject describe the following varieties: (1) the suppurative; (2) the pseudo-membranous; (3) the follicular; (4) the inflammatory or erythematous, and (5) the herpetic.

The erythematous form was first described by Rendu and Bouloche. The appearance of the fauces described by these observers agrees very closely indeed with that presented by my patient in the earlier stages of his illness. The etiology of their case was interesting. The patient, a nurse in a children's hospital, slept in a dormitory from which during the week preceding her illness three other nurses had been warded with acute pneumonia. Her illness developed very acutely with chills, intense headache and high fever and subsided by crisis with profuse sweating and diuresis after a duration of only 36 hours. There were no pulmonary symptoms.

Wyatt Wingrave.

The Proper Position of the Patient in the Operation for the Removal of Adenoids Under General Anesthesia.

C. R. HOLMES, Cincinnati, (*Laryngoscope*, May, 1905). As soon as complete anesthesia is obtained and while the child is still lying upon its back, the hypertrophied faucial tonsils are liberated by a blunt director from any adhesions; a few more whiffs of the anesthetic are given. The child is then quickly turned upon its left side, the left arm and shoulder drawn back so that the former lies on the table behind the child, the right arm is grasped near the shoulder joint by an assistant on the opposite side of the table, who lifts that half of the shoulder girdle away from the chest so as to secure ample breathing space, and at the same time to steady the child, the mouth gag

is reintroduced into the right side of the mouth by the principal assistant who manages the gag and slightly extends and steadies the head, the face is brought even with the left edge of the table or even slightly over the edge and the operator, equipped with an electric forehead mirror and seated on a stool of medium height on the left side of the table, removes the adenoid hypertrophy, quickly and thoroughly with the Gottstein curette or some modification of that instrument, and subsequently examines the naso-pharynx with the index finger of the left hand and removes with curved scissors and forceps any shreds or tags of the growth, or of the pharyngeal mucous membrane that may have been stripped up, as may rarely occur. The faucial tonsils are then removed if necessary with the cold snare or, if soft and ragged, with the curette, the adenectomy having been thoroughly done so quickly as to allow an ample margin of time for a double tonsillectomy before the patient emerges from under the influence of the anesthetic. As soon as the hemorrhage ceases, the patient is rolled over into the supine position, the left cheek cleaned from the few flecks of blood that are upon it, the towel removed from the head, and he is carried to his bed from which he is released the next day, to remain in his room in the hospital for three or four days.

Richards.

The Lymphatic Drainage of the Faucial Tonsils.

GEORGE B. WOOD, Philadelphia, (*The American Journal of the Medical Sciences*, August, 1905). This is an important experimental study made to discover how the micro-organisms from the tonsil may gain access to the general system.

Injections were slowly made into the tonsil, a solution of Berlin blue and turpentine being used after the method of Gerota. The direction of the drainage as established by the injections was as follows:

"The lymph vessels pass from the external portion of the tonsil through the peritonsillar connective tissue, the pharyngeal aponeurosis, and the superior constrictor of the pharynx, and, as one or two or more fine small vessels run obliquely in a downward, posterior, and outward course, passing below the facial artery. Bending more posteriorly the lymph vessels next run between the internal jugular vein and the stylohyoid muscle, reaching finally the superior surface of an enlarged lymph gland, placed just beneath the anterior border of the sterno-

cleidomastoid muscle, where it is crossed by the posterior belly of the digastric muscle. The efferent vessels from this gland are generally two or three in number, and pass into the neighboring glands of the internal jugular group. Further anastomoses which connects the lower glands of the internal jugular group with those receiving the tonsillar drainage form a complete lymph channel, through which the tonsillar lymph finally empties into the jugular lymph trunk."

This lymphatic gland the author names the "tonsillar lymph gland."
Richards.

The Significance of Tuberculous Deposits in the Tonsils.

GEORGE B. WOOD, Philadelphia (*Journal American Medical Association*, May 6, 1905). "The tonsillar tissue of the throat, because of its peculiar anatomic construction and its topographical relations, is more liable to become infected by tuberculosis than any other part of the upper respiratory tract. In nearly all cases of advanced pulmonary phthisis the faucial tonsils become inoculated. In about 5 per cent of hypertrophied pharyngeal tonsils some form of primary tuberculosis will be found. Primary infection of the faucial tonsil is a rarer condition.

Tuberculous adenitis in the cervical lymphatics develops in the majority of cases from infection originating sometimes in the faucial tonsils, but more frequently in the pharyngeal tonsil.

The tubercle bacillus is probably unable to pass through the tonsils without having first overcome the vital resistance of the tonsillar tissue.

The danger of systemic or pulmonic infection resulting from a tuberculous lesion in the tonsillar tissues of the throat is about equal to that of tuberculosis of the cervical lymphatics. The lesion to be expected as a resultant infection from the broken-down glands of the neck is a miliary tuberculosis of the lungs. Further than this possibility, tuberculosis of the lymph glands of the neck is no more dangerous than a localized tuberculosis lesion in any other portion of the body.

The tonsils are more resistant to the action of bacterial toxins than ordinary lymphoid tissue."
Richards.

Methods of Operation on the Tonsils.

WILLIAM LINCOLN BALLENGER (*Chicago, Illinois, Medical Journal*, 1905). The technique of Ballenger's method is as follows:

- (a) Anesthesia, general or local.
- (b) The dissection of the tonsil from the pillars with a right-angled tonsil knife or Beck's tonsil scissors.
- (c) The uniting of the two incisions at the apex of the tonsil, thus converting the three united incisions into an inverted U shape. While the incisions are being made the tonsils are strongly drawn toward the median line of the throat with a pair of vulsellum forceps of special pattern.
- (d) The vulsellum forceps are next passed through the fenestra of a wire ecraseur or other form of tonsillotome, the upper blade into the dissection portion, the lower grasping the base of the tonsil. The tonsil thus grasped between the blades of the forceps is drawn through the fenestra of the écraseur.
- (e) The blade of the ecraseur is then closed, thus detaching the remaining lower portion of the tonsil.

As a substitute for the Peter's wire snare he uses a ring blade somewhat after the style of the Mathieu's tonsillotome, but of which the blade is rounded after the manner of cold wire. The instrument thus becomes a tonsillotome and ecraseur all in one.

Richards.

Cases of Primary and Secondary Tonsillar Hemorrhage Following Removal Both with Tonsillotome and Snare.

EDWARD J. BROWN, Minneapolis, Minn., (*Laryngoscope*, 1905). Case 1. Student 28 years of age, two large fibrous tonsils removed with Bishop tonsillotome. Considerable hemorrhage from a steadily spurting stream at the base of the left tonsil. Astringent applications being of no avail, success was finally obtained by persistent pressure and counter pressure with the thumb and fingers of the right hand.

Case 2. Female 33 years of age, submerged tonsil removed with the Peter's snare, No. 10 piano wire. Fifteen days later severe hemorrhage in the night, persisting for seven hours before controlled.

Case 3. Girl 6 years. Incomplete removal of the tonsil with heavy Peter's snare. Severe hemorrhage two days later controlled with difficulty by the family physician. Two quarts of blood vomited.

The author says that after thorough removal he has never seen serious hemorrhage.

Richards.

Frenum Uvulae.

F. MARSH (*British Medical Journal*, April 15, 1905). Mrs. L., aged 35, was seen on February 11th, 1905, for chronic ear trouble. On examination of the throat the uvula was seen to be bent forward at an acute angle, and to be tied closely to the soft palate by a distinct band, about the thickness of the frenum linguae, attached in the middle line to both uvula and soft palate. The uvula was quite half an inch long, and the frenum extended the whole length. No discomfort nor inconvenience was experienced by the patient, who was not aware of any departure from the normal.

The case is recorded on account of its rarity. The writer is not aware of any record of a similar condition.

Wyatt Wingrave.

Blood Poisoning from Tonsillitis.

SIR J. OWEN, (*Lancet*, Oct. 15, 1904). Case of male aet. 22 suffering with acute non-diphtheritic tonsillitis associated with high temperature (104.5). There was arthritic and pulmonary trouble with delirium lasting 14 days. He was treated successively with antiseptic toxine, and Roux's sera and finally with iron perchloride with complete recovery. The blood contained streptococci.

Wyatt Wingrave.

Salivary Calculus Simulating Angina Ludovici.

WYATT WINGRAVE, (*Brit. Lar. and Rhin. Assoc.*, November, 1904). Male aet. 80, had a painful swelling below tongue and around hyoid region for 5 days with difficult deglutition: Fixing of mandibles. Lingual tonsils much swollen, with edema of epiglottis. Incision was made in glosso-alveolar fold near frenum linguae, from which a large calculus measuring 25x8 mm. and weighing 2.5 grammes was removed.

Wyatt Wingrave.

Vincent's Angina.

BRUCE, (*Lancet*, July 16, 1904). Good clinical and pathological description. Draws attention to the close similarity between the disease and ulcerative stomatitis.

Wyatt Wingrave.

IV.—LARYNX.

The Effect of the Rays of Radium Upon the Mucous Membrane of the Larynx: A Preliminary Report.

W. FREUDENTHAL, New York City (*The Archives of Electricity and Radiology*, September, 1904). The case is one of tuberculosis of the larynx with the left vocal cord ulcerated and stalactitic excrescences in the inter-arytenoid space.

A small glass tube of radium containing 0.25 grammes of 20,000 strength was put into a receptacle and the whole screwed on to a strong probe. The probe was bent so as to fit the shape of the larynx and inserted after thorough cocaineization. The patient took the probe between her teeth, while an assistant supported its end. The period of time it was held varied from twenty to thirty minutes. It was applied ten or eleven times.

The only effect was that granulation or infiltrations sprung up from different parts of the larynx, diminishing its lumen materially so that the treatment had to be stopped twice on account of slight dyspnoea. These granulations rapidly diminished after cessation of the treatment. On one occasion the voice was improved on account of some sort of approximation of the vocal cords as a result of the granulations springing up so rapidly, consequently producing a louder voice.

There was no real improvement from a pathological standpoint, although eight weeks after discontinuing treatment the patient reported that she felt easier in her throat and tickling sensation had disappeared to a considerable extent.

Richards.

Foreign Body in the Bronchus; Removal with the Aid of the Bronchoscope—Recovery.

SIDNEY YANKAUER (*New York Medical Record*, February 11, 1905). The child was a boy of ten months who had sucked an orange-pit into the right bronchus, followed by coughing, dyspnoea and cyanosis. Operation four hours after the accident, inferior tracheotomy under chloroform. Bronchoscope 7 mm. in external diameter introduced into the tracheal wound and pushed forward until near the bifurcation. Foreign body was seen lying with one end impacted in the right bronchus, was seized in the bronchoscope forceps and the bronchoscope and foreign body withdrawn together. The pit measured 17 mm. long, 6 mm. wide and 5 mm. thick.

Only a very small amount of chloroform was used, the anæsthetic being discontinued as soon as the trachea was opened.

Richards.

A Case of Paralysis of the Recurrent Laryngeal Nerve, from Aneurism of the Arch of the Aorta.

HILL HASTINGS, Los Angeles, Cal., (*Journal A. M. A.*, June 3, 1905). In this case the diagnosis of aneurism was made from the laryngoscopic examination. The patient was referred on account of hoarseness and there was complete paralysis of the left vocal cord, which remained in a position of cadaveric rigidity during phonation and respiration. There was no tumor of the larynx or neck. Aneurism pulsation was in the right second intercostal space, close to the sternum, and distinctly seen when the chest is in the proper light. Pulsation was synchronous with the apex beat. The left recurrent laryngeal was pressed upon by the aneurism.

Richards.

Chronic Laryngitis.

E. FLETCHER INGALS, Chicago, (*Laryngoscope*, March, 1905). Inga's reports eighty to ninety per cent of the cases as due to or kept up by nasal obstruction, and the first thing to do in order to cure larynx is to remedy the nasal condition. Local applications of stimulating or astringent character should be of sufficient strength to cause discomfort for one or two hours.

He has not found watery solutions in the atomizer in the hands of the patient as very satisfactory so far as getting the solution into the larynx and trachea is concerned. Oily solutions are more readily inhaled but as commonly employed by the patient, have little effect.

The patient's general condition should be looked after.

Richards.

An Unusual Case of Edema of the Glottis.

EMIL MAYER, New York City, (*The American Journal of Medical Sciences*, August, 1905). The case was one of edema of the glottis engrafted upon an hereditary syphilis of the epiglottis, which latter had never produced any notable symptoms relative to the throat except the constant cough. When seen there had been constant dyspnea for thirty-six hours.

There was a large, glistening mass at the base of the tongue, filling the entire pyriform sinus, which, on being incised, exuded a quantity of thick, bloody and ill-smelling fluid, which showed the presence of staphylococcus albus and streptococcus. Recovery was rapid. *Richards.*

Laryngeal Stridor in an Infant.

R. FULLERTON (*British Medical Journal*, January 16, 1904). Infant 3 days old had repeated attacks of suffocation and stridor, lasting 30 minutes, with intervals of 10 minutes. Cyanosis. Oxygen and artificial respiration relieved symptom. Stridor was inspiratory: Glottis could not be seen and there were no adenoids or enlarged tonsils. Tracheotomy under chloroform completely cured stridor. Tube removed and stridor returned but gradually disappeared. Recovery complete. (No reference to nasal breathway state. Abstractor).

Wyatt Wingrave.

Papillomatous Growths Occurring in the Larynx of the Child.

L. D. BROSE, Evansville, Ind. (*Journal American Medical Association*, March 18, 1905). Two cases are reported, the first a boy of 11, in which the growth was removed by the use of an intra-laryngeal snare, and the second in a child of 3 years, from which the growths were removed after a preliminary tracheotomy and secondary thyrotomy. The small size of the larynx in a child renders thyrotomy a difficult operation.

Richards.

A Century of Intubations.

GEORGE F. COTT, Buffalo N. Y., (*Laryngoscope*, February, 1905). The intubation tube must be allowed to remain in position until the patient is perceptibly improved. This may be twenty-four hours or five or six days. A certain number of cases will need re-intubation. This cannot be told beforehand. Do not allow the patient to partake of solid food while wearing the tube. *Richards.*



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XXXVII.

THE ETIOLOGY AND TREATMENT OF MYCOSIS OCCURRING IN THE UPPER RESPIRATORY TRACT*.

(WITH ILLUSTRATIONS.)

PRIZE ESSAY BY JOHN SENDZIAK, M. D.,

WARSAW.

The following are the particular varieties of mycoses met with in the upper respiratory tract:

- I. Mycosis leptothricia—causative agent, *leptothrix buccalis*.
- II. Mycosis sarcinica—causative agent, a variety of the *sarcina*.
- III. Actinomycosis—the causative agent being the *actinomyces*.
- IV. Mycosis aspergillosis—caused by various kinds of *aspergillus*.

*Presented before the American Laryngological, Rhinological and Otological Society, Boston, June, 1905.

- V. Mycosis mucorina—produced by certain varieties of *mucor*. This, according to some authors (Cixlinski, Hewelka, Sendziak, as well as Schmiegelow), causing the so-called “black-tongue.”
- VI. Mycosis oidica (soor) caused by the *oidium albicans*.

I. MYCOSIS LEPTOTHRICIA.

Its synonymous terms are mycosis tonsillaris benigna (B. Fraenkel), pharyngo-mycosis leptothricia (Heryng), algalosis (Plycosis), faucium leptothricia (Jacobson), and finally hyperkeratosis lacunaris (Siebenmann).

In the year 1873 B. Fraenkel, a distinguished professor of laryngology in Berlin, was the first to draw attention to the hitherto unknown pathologic process—the formation on the faucial tonsils, as well as on the base of the tongue of white and grey, prominent, strongly adherent tufts, which being removed with difficulty, soon reappeared. Under the microscope, these tufts were shown to consist of epithelium and micro-organisms (bacilli and cocci); in the second case observed by the same author (in 1880) the examination showed for the most part leptothrix buccalis. Fraenkel found the bacillus fasciculatus present in this case. The course of this disease, to which the author gave the name “mycosis tonsillaris benigna” is without fever and chronic in character.

In the year 1883, Heryng of Warsaw made a minute histologic and bacteriologic examination of six cases. He gave a detailed description of this disorder, which, because of the constant existence in the tufts of leptothrix buccalis, he called pharyngo-mycosis leptothricia. These tufts are mostly composed of horny flat epithelium, surrounded by small, white, granular masses and threads of the leptothrix. These latter color blue with iodine.

Since that time great attention has been drawn to this pathologic process, and articles began to appear in all the countries of Europe as well as in America, where the greatest interest was manifested in this disease, one-third of all the papers published appearing in America. French, German, and English literature is replete with papers on the subject, but in Denmark, Sweden and Norway there has been very little written, which can be explained only by the lack of suitable material in these countries.

Besides the articles mentioned by Fraenkel and Heryng, Siebenmann of Basle (Switzerland), published the results of a

minute histologic and bacteriologic investigation, from which he arrived at a different conclusion than that of either Fraenkel or Heryng. He held that the essence of this process consisted in a cornification of the lacunar epithelium:—hence his definition of the process—"hyperkeratosis lacunaris."

The etiology of mycosis leptothricia has not been positively decided. There exists two principal theories:

- (a) The parasitic, and
- (b) The chemical theory.

The parasitic theory has the greatest number of adherents. According to this theory the ordinary inhabitant of the oral cavity—the leptothrix buccalis—is the causative agent of this pathologic process. As already mentioned, both Fraenkel and Heryng found this organism in this disorder. Alone, or in great preponderance over other organisms present, this agent was found by the following: Semon, Wingrave, Kinny, Gray, Santabo, Provost, Ruault, Nabias, Sabrazés, Ferré, Krakenberger, Chiari, Jacobson and others.

Some authorities (Hemenway, Rauge), while not denying the parasitic origin of mycosis leptothricia, do not regard the leptothrix buccalis as the causative agent. They hold that other micro-organisms found normally in the oral cavity can produce this type of mycosis also (Parser, Tidswell). In justification of their opinion they cite the fact that leptothrix buccalis is often found on the gums in the neighborhood of carious teeth, a condition in which we do not usually meet with mycosis leptothricia (Hemenway). Chiari, basing his opinion on the observation that there exists only an increase in the number of leptothrix buccalis present, does not regard mycosis leptothricia as an independent pathologic process.

It was Kyle, an American, who, basing his opinion on very minute bacteriologic investigations (in the year 1891), became convinced that in this disorder the micro-organisms act a secondary part, their action principally consisting in causing a chemical reaction in the tissues and secretions. The non-parasitic origin of this disease was also held by Higguet and previous to him by Toeplitz. The claim for priority of the chemical theory, however, belongs to Prof. Siebenmann, who in the year 1895 observed and made a histologic and bacteriologic study of six cases, and who gave out the basis of the chemical theory, endeavoring to limit the role of the leptothrix buccalis in the disorder to that of a simple "saprophyte."

As the principal feature of this disorder, he regards the exceeding strongly marked cornification of the lacunar epithelium. He noted under the microscope the existence of corneous epithelium without nuclei, which protruded in shape like a corneous thorn. These thorns have a central excavation filled with detritus, mucus, and micro-organisms. The parts of such thorns which protrude from the crypts of the tonsils are covered on their external surface with a network of leptothrix.

Referring to the above-described process, this author proposes to change the hitherto used term, mycosis leptothricia, for another more suitable, viz.: hyperkeratosis lacunaris, regarding the latter as an analogous pathologic process to that known as pachyderma of the larynx, leucoplakia of the oral cavity and to a certain extent comparing it to the so-called "black tongue." In regard to the last-named disease, however, opinions are also divided, as we shall see later.

Siebenmann's theory did not find many adherents; but Kraus (Vienna), Lincoln, Friedland, Richardson (America) and Hall (London) are among those who believe with him.

Kyle maintains that we must distinguish two pathologic forms: one which we regard as mycosis leptothricia being simply keratosis, in which condition he disagrees with Siebenmann as to the localization of the pathological process in the crypts of the tonsils, and consequently in his opinion the definition "hyperkeratosis lacunaris" is inapplicable; and, secondly, a form of typical mycosis leptothricia, i. e., a disease depending on the presence of leptothrix buccalis. Kyle also holds that there exists cases of mycosis leptothricia without the participation of the leptothrix buccalis. However that may be, in many typical cases of keratosis we do meet with this micro-organism.

The greatest number of authorities, and among these I number myself, are of the opinion that we are dealing with a typical mycosis caused by the leptothrix buccalis. (Figs. 1 and 2.)

In reference to the term leptothrix buccalis which was introduced into medical science for the first time by Robin, according to Miller, the author of an excellent monograph on the micro-organisms of the oral cavity, we must understand the constant inhabitant of the buccal cavity to be leptothrix in-nominata, bacillus maximus buccalis, spirillum sputigenum and spirochete dentium. Of these the most important is the

bacillus maximus buccalis, which Kraus claims is identical with the *leptothrix buccalis* of Robin.

This organism presents itself in the shape of bundles composed of parallel threads, 1 to 1.3 micra in width, which color, in a solution of iodine dissolved in potassium iodide, a blue-violet. In the soft white sediment on the teeth, one finds *leptothrix innominata* as well as *leptothrix maxima buccalis*, and a similar organism, the *bacillus maximus buccalis*, which colors yellow in iodine. The *iodococcus vaginatus* appears usually in small chains composed of 4-8 cells sticking on the integument, and colors as follows: the cells become bluish violet, the capsules slightly yellow. There has been no success in obtaining

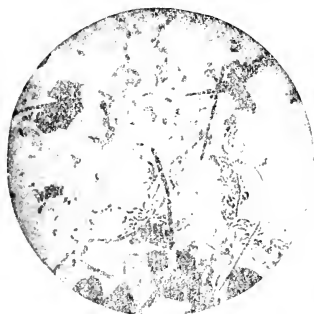


Fig. 1.

Micro-organisms of the oral cavity
(*leptothrix buccalis*, etc.).



Fig. 2.

Aspergillus fumigatus.

pure cultures of *leptothrix buccalis*, although Jacobson maintains that in $\frac{3}{4}$ of his cases he seemed to obtain the culture from the tufts situated in the crypts of the tonsils.

Great development of this inhabitant of the oral cavity seems to favor fermentation in the mouth, as well as to cause acidity of the saliva (Fraenkel); it predisposes to caries of the teeth (Kyle); and may aid in predisposing to gastric trouble (Donnellan, Richardson).

Mycosis leptothricia of the upper respiratory tract is by no means as rare a disease as was formerly supposed, but is rather of frequent occurrence. The literature to date places some

hundred cases on record, which for the period of time—a little more than thirty years, i. e., from the first description of this disorder—is proof enough of its comparative frequency.

I observed mycosis leptothricia 42 times in about 20,000 patients: that is, once in every 500 patients. Krakenberger met with the disease much more frequently, namely, 11 times in 579 patients; on the other hand, Prof. Jurasz (Heidelberg) observed it only 3 times among 4,000 patients. What is the cause of this difference in the statistics? I am of the opinion that the reason for this lies in the fact that Jurasz's material came from the polyclinic, i. e., from among the poor who were undoubtedly less liable to become afflicted with mycosis leptothricia. My material is composed of ambulatory (16 cases) as well as private practice (26 cases from among the general number of 10,000 patients), while Krakenberger's cases are mostly from his private practice.

Mycosis leptothricia is relatively more frequent in females than in males—24 to 18 was the ratio in my cases. Other authorities (Krauss, Rosenberg, Phillips) have made similar observations. Heryng had 8 cases in females and 6 cases in males.

The ages of my patients who were afflicted with this disorder were as follows:

- between 10 and 15 years there were 5 cases,
- between 15 and 20 years there were 11 cases,
- between 20 and 30 years there were 13 cases,
- between 30 and 40 years there were 10 cases,
- between 40 and 50 years there were 2 cases,
- between 50 and 60 years there was 1 case.

The above figures show that mycosis leptothricia occurs in the respiratory tract mostly in adults, especially between the ages of 15 and 40 years. 34 cases, almost $\frac{4}{5}$ of all, occurred in these ages; before 10, and after 40-50 years of age its occurrence is very rare.

There are only two cases on record below the age of 2 years—the age of Dubler's patient was 8 months.

In reference to the influence of occupation, my cases present the following:

Of 24 females, 15 were unmarried, 7 married and 2 were widows; of the 15 unmarried, 9 were pupils and 1 was a governess; of 18 males there were 4 schoolboys and 2 students, besides 4 landed proprietors, 1 engineer, 1 cashier, 1 civil of-

ficer, 1 pensioner, 1 joiner, 1 watchmaker, 1 cook and 1 tailor.

The frequent occurrence of mycosis leptothricia in the "school age" of both sexes, markedly so in girls, is striking. That they are predisposed to it at this time is likely, although unhygienic conditions as well as overburdening them with work is also of importance. It is more difficult to understand the frequent occurrence of this disorder among landed proprietors who live under conditions that seem least predisposing to the development of this mycosis. In my cases, I have noted the frequent occurrence of mycosis leptothricia in the better classes, i. e., in private practice.

W. C. Phillips made the peculiar observation that this disease occurs especially in young women very fond of pets, such as dogs, cats and horses, and H. H. Curtis observed that almost every one of his patients had been accustomed to eat raw apples which very often had been licked by such animal pets.

In Myles' cases keratoid spots developed suddenly during an exclusive milk diet.

Undoubtedly one must reckon among the predisposing causes of this disorder bad health (Semon), although, as I have mentioned before, healthy people are not free from this mycosis.

In five of my cases—young girls—there were distinct symptoms of anemia, and in one case, the patient had a typical chlorosis.

Rosenberg observed the disease in a pregnant woman.

Further, I noted in one of my cases—a female 33 years of age—symptoms of tubercular affection of the lungs. Richardson's observations show the presence of more or less pronounced gastro-intestinal disturbances.

The predisposing causes of this disorder may be summed up in saying that a diathesis to this disease has been noted (Root), that any catarrhal affection of the upper respiratory tract, and the acute infectious disease, play some predisposing role—Glasgow having noted the disease as following influenza—but the abuse of alcohol and tobacco do not play an important part as a predisposing agent. I only noted the abuse of tobacco in two of my cases.

The localization of mycosis leptothricia in the upper respiratory tract: According to Siebenmann's theory, i. e., of keratosis, the oral portions of the pharynx, especially the faucial tonsils and their crypts, are the seat of the lesion. Hemenway

even proposes the term mycosis tonsillaris. I do not support this proposition. There can be no doubt that mycosis leptothricia can embrace any part or all of the upper respiratory tract extending from the nasopharyngeal cavity (Garel, Labit), affecting for the most part Luschka's tonsil, extending even to the ostia pharyngea tubarum (M. Schmidt), and finally involving the fossa Rosenmuelleri (Law) and ending at the larynx,—or at the laryngeal surface of the epiglottis (M. Schmidt, Grant). The disease has been observed at the ary-epiglottic ligament (Dubler); Root has seen it at the sinus pyriformis; the vocal cords have also been affected (Price-Brown), and even that portion of the larynx below the cords has been the seat of the disorder (Cobb, Dubler).

All these cases speak against Siebenmann's theory. On the other hand, it is unquestionably true that the most frequent seat of mycosis leptothricia is the faucial tonsil. In my cases these were affected 15 times, the left one 8 times and the right 5 times; in the remaining two cases both tonsils were equally affected; the left tonsil alone was affected 3 times, the right alone only once. In a relatively larger number of cases the tonsils and the base of the tongue, i. e., the lingual tonsil, were the seat of mycosis leptothricia—this occurred 13 times. Both Fraenkel and Kraus believe this region the most frequent seat of the disorder. Heryng saw the affection of the tonsils, alone, 7 times and 7 times he observed the disease also involving the base of the tongue. A rather rare case of this mycosis, in which it was situated on the body of the tongue, was observed by Tuttle.

The disease is principally situated in the crypts of the tonsils; exceptionally, however—as seen in one of my cases—the principal seat of the lesion is the lingual tonsil at the base of tongue. I saw the lesion on the lingual tonsil alone in 3 cases. Rarely both faucial tonsil and pharyngeal tonsil are affected simultaneously—this occurred in only one of my cases. I saw the whole pharyngeal ring involved only once; in two cases, the faucial tonsils, the pharyngeal walls, which were covered with granulations, and the lateral folds behind the posterior arches were affected. Once the faucial tonsils, the base of the tongue, the lingual tonsil and the pharynx were the seat of the lesion, and, finally, in one case the faucial and lingual tonsils as well as the laryngeal surface of the epiglottis were affected.

Summing up, there can exist the most varied combinations as to the location of the lesion. The rare case observed by Curtis, wherein the extension of the mycosis went through the nasal ducts to the eye, besides involving the pharynx and larynx, is a case in point. Once I observed laryngeal involvement alone—typical tufts on the vocal cords—and Grey saw the region of the arytenoid cartilage involved, the corresponding vocal cord being immobile. In Price-Brown's case the affection coated the ventricular bands and in Cobb's case the vocal cords and the lower part of the larynx were the seats of the lesion.

Clinical Picture.—Mycosis leptothricia in the upper respiratory tract shows itself in the form of more or less numerous pearly white, hard tufts or spots which are situated in the crypts of the faucial tonsil, the lingual tonsil, and sometimes seen in the follicles of the posterior pharyngeal wall. These tufts are characterized above all by a corneous consistency, having the appearance of thorns, or, as described by Schmidt, of stalactites; or by Toeplitz as condylomata. They are further characterized by their exceedingly strong adherence to the adjacent tissues, their removal being attended with great difficulty, and followed by abundant hemorrhage. The tissues surrounding them may be entirely normal or in a state of catarrhal inflammation. It is a debatable question whether this latter condition has or has not a causal relationship with leptothrix buccalis (M. Schmidt).

These tufts, as a rule, form slowly, without inflammatory symptoms, although exceptionally they do occur in more acute forms (mycosis leptothricia acuta, or angina leptothricia). Of the last named disorder, cases were described by Santabo and Dubler (a case of a child eight months of age followed by death), Ruault, Spaans and Unterholzner (each observed 3 cases). Personally I saw four cases of leptothricia acuta.

The Course of the Disease.—The course of the disease is generally slow. It may last weeks, months and even years. Generally during the later periods the tufts begin to show ramifications. Their removal is then easier (Parker). The process may cease spontaneously. Ordinarily, however, mycosis leptothricia is characterized by great resistance to treatment and relapses are frequent, even after the most energetic attempts at complete removal of the organisms.

Symptoms.—Mycosis leptothricia may occur in the upper respiratory tract without giving any symptoms of its presence. Patients come for consultation, anxious because of "white spots" on their tonsils, or the physician only accidentally discovered the spots when looking for some other disease (Michelson, Root). I, personally, had occasion to see such cases. Occasionally this disorder gives rise to a train of symptoms, as, for instance, scratching and pricking, burning, stiffness, fullness in the throat, disagreeable taste (Root), and pain in the throat (Ingals). In most of my cases there existed a sensation of a foreign body (the so-called paresthesia pharyngis); twice I observed fetor ex ore, and in 3 cases of Ingals, there were symptoms of dyspepsia; this was also the disturbing symptom in Richardson's cases.

Naturally in the acute forms of mycosis leptothricia there may exist dysphagia, fever and enlarged lymphatic glands of the neck (Spaan, Unterholzner).

Diagnosis.—The diagnosis of mycosis leptothricia generally does not present any difficulties, thanks to its highly characteristic symptoms, namely, the appearance and consistence of these corneous tufts situated in the crypts of the tonsils, so that even without the microscope the diagnosis is possible (Kraus). In all my cases I was able to make this diagnosis a priori, after which I proved its correctness by the microscope. As to the differential diagnosis, the condition most similar to mycosis leptothricia is "tonsillaris caseosa" and this differs from it in the consistency of the tufts; here they are soft and easily removed, and are localized to the tonsillar crypts, while mycosis leptothricia may occur, as already shown, in any part of the upper respiratory tract—except the nasal cavities.

The microscope should solve all doubt as to mycosis leptothricia, the tufts being composed entirely of the characteristic threads.

For a rapid examination, Seifert and Kaln advise that the masses be rubbed on an objective glass, acidified with a few drops of lactic acid, and then colored with $\frac{1}{2}$ drop of a solution of iodine in potassium iodide. The large bundles and heads of the leptothrix buccalis will show themselves colored blue. (Fig. 3.)

In cases of caseous tonsillitis, we meet with various organisms from the oral cavity, among which, however, there may also be the leptothrix buccalis, but then this organism is pres-

ent in small numbers. Besides, as caseous tonsillitis is the result of a desquamative inflammatory process, the tufts will be composed of corneous epithelium, mucus, leucocytes, and particles of food, etc. In my opinion, a certain number of caseous tonsillitis cases, if examined minutely under the microscope, will turn out to be cases of real mycosis leptothricia. This took place in one of my cases. A woman of 33 years came to me with soft tufts in the crypts of both tonsils—the diagnosis of tonsillar caseosa was made, but under the microscope leptothrix buccalis was found to be the true condition present.

Of the acute inflammatory processes, the condition most simulating mycosis leptothricia is the angina tonsillar follicularis, wherein, however, the high fever as well as the swelling of the lymphatic glands of the neck is distinctive. Less similar is diphtheria; here we do not have to deal with tufts and spots, but with a membrane. At any rate, diphtheria sometimes simulates this disorder, and a proper diagnosis can be made only through the use of the microscope.

Prognosis.—The prognosis of mycosis leptothricia of the upper respiratory tract is in general a favorable one; spontaneous recovery is possible (Semon). It took place in one of my cases. Relatively the prognosis is not so favorable. Mycosis leptothricia is a very obstinate disease and relapses are common. In literature there is recorded only one death—Dubler's cases, a child of 8 months.

Treatment.—Some authorities, among whom are Semon, Schmidt, Richardson and Kraus, are of the opinion that in cases without subjective symptoms local treatment is superfluous, the more so as spontaneous recovery is a possibility. Where the general health is bad, treatment should be applied to remedy this—tonics, change of air, sea voyages, etc. (Semon, Wilson). In cases where such exist, correction of disturbances of the gastro-intestinal tract are indicated (Richardson). The greater number of authorities, and to their opinion I adhere, believe that local treatment should be undertaken, and that it should be of a most energetic nature in order to avoid relapses.

Besides gargles of bichlorid, 1 to 2000 and as strong as 1 to 1000 (Chiari), 1 to 500 (Parser) and even as strong as $\frac{1}{2}$ to 2 per cent (Puterman), 5 per cent zinc chlorid has been used by Nabais and Sabrásés; silver nitrate 1 to 25 per cent has been used by Powers and Tuttle; acido salicylic, 1 to 4 in alco-

hol, has been employed by Tilly; absolute alcohol is the recommendation of B. Fraenkel and Baber; pyoktanin, 10 per cent, is recommended by Curtis and Lincoln; formalin, 10 per cent solution, has been employed by Lederman; tincture of iodine by Grant; nicotin in a proportion of 0.2 to 100 by Jurasz. (In one of my cases I had good results from the use of this drug.) Chromic acid is recommended by Griffin, Prevost and Wagner, and finally trichloroacetic acid alone, or after the application of the galvanocautery is recommended, a procedure which netted me the best results. Stern and Arnsperger recommend a radical method of treatment, namely, that of curetting the tufts with a sharp spoon; Root follows this with the galvanocautery. The best method is to puncture the crypts with a sharp cautery. This last named method has many adherents, among whom we count Heryng, Deckert, Seifert, Hemenway, Thomas, Cheatham, Hamilton, Kenny, Wartham, Price-Brown, Hall, Phillips and myself.

Pooley recommends free slitting up of the canaliculi and curetting them in cases where the leptothrix is situated in the canaliculi of the tonsils.

The adversaries of the galvanocautery include Spicer, Otuszewsky, and especially Semon, the latter of whom, after having cauterized mycosis, situated on the base of the tongue, observed parotitis take place with high fever (40° C.). In one of my cases I had disagreeable complications after the use of the cautery on the lingual tonsil, high fever and great prostration; this occurred in a woman 25 years of age.

It must be understood that wherever there exists a distinctly expressed hypertrophy of the tonsil, this should be extirpated, and this is best done by means of the galvanocautery snare, in order to avoid secondary bleeding.

Finally, I must note the favorable influence of tobacco smoking upon the course of mycosis leptothricia, which was observed by Jurasz, Donellan, M. Schmidt, Collin, and finally by me in a patient 30 years of age, who, after having commenced to smoke, remarked, after a little while, that all the tufts on his tonsils disappeared entirely, without any other treatment. Of this observation I am sure. We must not forget, however, that tobacco is a two-edged remedy and as such ought not to be recommended (M. Schmidt).

II. MYCOSIS SARCINICA.

This disease occurs in the upper respiratory tract on the mucous membrane of the oral cavity in persons who suffer from disease of the lungs, pneumonia, bronchiectasia, gangrene, and especially in persons suffering from tuberculosis or typhoid. It occurs in patients having any catarrhal trouble of the mucous membrane of the oral cavity—stomatitis; it is present in marasmic patients, and it may occur in healthy persons.

From the oral cavity and the pharynx, the mycosis may extend to the lungs, as well as to the stomach, where the parasite—*sarcina ventriculi*—was discovered for the first time by Goodsire (1842) in stomach contents.

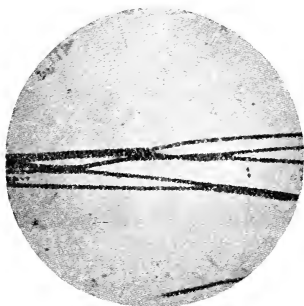


Fig. 4.

Leptothrix buccalis (Gentian violet).

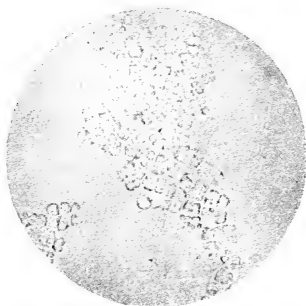


Fig. 5.

Sarcina (yellow-green) from air.

Sarcina enters the upper respiratory tract from the air, where it is present in various forms. In the lungs we find the colorless form, while in the oral cavity its most frequent form is the yellow-green type. (See Fig. 5.)

This parasite is found on the mucous membrane of the tongue, as well as on the soft palate (Fischer, Friedreich) in whitish diffuse masses similar to mould (soor). Under the microscope they present themselves as colorless or yellow-brown, round or small oval cells 2.5 micra in diameter, which are chained one to the other (8 examples). They form small hexagonal figures, rounded at the angles and sometimes arranged in large patches.

Recent investigation has shown that we are not dealing with a distinct type of sarcina in any one condition, but that all or any kind may occur in the body which are found in the external air. Mycosis sarcinica has no particular importance. General symptoms are lacking. On the whole, little has been written on this question, and we must refer those interested to Fischer's paper.

III. ACTINOMYCOSIS.

The parasite is the actinomyces. The cause of this pathologic process was discovered in the year 1845 by Langenbeck, and in the year 1877 Bollinger discovered it in horned cattle, among which the disease is most common. To Prof. Israel, however, belongs the honor of having first definitely described this parasite as a substantial pathologic process in man.

Some authorities (Niessen, Hesse) maintain that actinomycosis depends on other parasites, among which is the *cladotrix liquefaciens* (Hesse), yet Wolff and Israel, as well as Ponfick and Bostrom, the most authoritative investigators of this disease, do not agree with this opinion.

The subject of actinomycosis of the upper respiratory tract is covered by many papers, the greater number of which were published in Austria, Germany, France and Sweden.

The parasite is usually transferred indirectly to man, exceptionally it is transplanted directly from cattle. Bardez observed a case wherein infection took place from the mouth of a man to the mucous membrane of a child by means of a kiss. This author believes that flies are also a source of possible infection.

Actinomycosis is primarily located in the oral cavity, on the alveolar process of the lower jaw (Mikulicz), causing periostitis alveolaris. It rarely spreads through carious teeth to cause actinomycosis of the lower jaw itself. Rarely a primary pyorrhea alveolaris is present. When we see the patient there is usually the growth or abscess on the lower jaw, and sometimes fistulæ, from which a slight amount of secretion exudes.

On the summit of the tongue the growth is very hard and strongly circumscribed. That it is sometimes localized there, is evidenced by the cases of Flackner, Bargez, Fischer, Mayer, Hochenegg, Albert, and finally by Bonnet, who, in his dissertation in the year 1896, cited 5 cases of this kind, finding the mucous membrane of the cheek also affected in the neighborhood of the ductus stenonianus (Partsch).

The growth on the tongue, in size equal to that of a pea, shows a slight predisposition to destruction.

From the oral cavity, actinomycosis may extend to the pharynx, producing great swelling in the palatopharyngeal region, with white-yellow nodules identical in appearance to follicular abscess. Retropharyngeal abscess, caused by the actinomycosis was observed by Schlinge. It seems to avoid affecting the faucial tonsils. Butlin, the author of the best monograph on diseases of the tongue, fails to mention any case of actinomycosis of the tonsils. More recently, however, Cheatle, Emory, Wright, Thevenat, Ruge, Mikulicz, Didsbury and Bonnet would seem to deny this observation in which Israel originally concurred.

Further, actinomycoses may spread to the larynx, affecting the arytenoid cartilages and the cords, and extending to the posterior mediastinum (Mündler). The involvement of the larynx may also take place by extension of the pathologic process from the external portion of the neck to the thyroid cartilage (cases of Henrici, Kochier, Bérard, Lubliner and Mündler). I observed such a case in a patient 53 years of age.

Primary actinomycosis of the esophagus was seen by Garde (6 cases); its appearance in the esophagus, as a secondary process, was reported by Abbé.

In general, actinomycosis of the upper respiratory tract does belong to the rare diseases. There are published in literature some 200 cases in point. In some countries it seems to be almost epidemic, namely, in Austria and Germany, where about one-half of all cases recorded occurred.

The disease is twice as frequent in men as in women, which is explained by their occupation bringing them oftener in contact with cattle than does the occupation of women. It affects those between 10 and 40 years of age; below 10 and above 40 the disease is very rare. I had one case—a landed proprietor—who was 53 years of age.

The course of actinomycosis in general is chronic—rarely sub-acute—and exceptionally acute with purulent symptoms (Roosa, Kapper). On account of secondary infection with purulent micro-organisms, lymphatic involvement may be produced (Cheatle, Emory).

The symptoms of actinomycosis of the upper respiratory tract consist, in general, of very violent pains in the region of

the pathologic process—in carious teeth; in neuralgic pains on the corresponding side of the face, although some authorities (Wright) give, as characteristic, the complete absence of pain. In acute cases there are present fever, chills and attacks of suffocation and pain during the act of swallowing (Kapper).

The diagnosis of actinomycosis should not be difficult, except in the beginning forms, where the condition presents nodular infiltrations, and then the disease is apt to be mistaken for malignant neoplasms (carcinoma). The chronic course, the greatly indurated surrounding parts, the slight excretion exuding from the fistulous opening, the localization of the trouble to



Fig. 6.

Actinomyces bovis (cuts of the growth on the tongue) Gram-Günter.

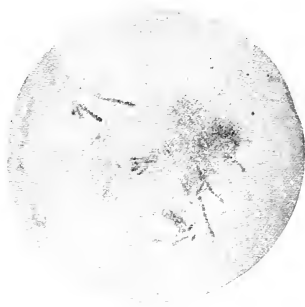


Fig. 7.

Actinomyces bovis (growth on the lower jaw) Gram's method.

the face and neck (Illich) and finally the noninvolvement of the lymphatic glands—all these points help in a certain degree to make the diagnosis. When the abscess is already formed, then the diagnosis is easy, because of the characteristics visible to the naked eye, the pus examined containing suspended in it the yellow grains, which under the microscope, after coloring with potassium, show the radiant structures with mace-like ends of the actinomyces. They also color well by Gram's methods, or better still its modification, i. e., with the addition of carmine (Gram-Günter) the threads coloring bluish-black, the butts red. (See Figs. 6 and 7.)

Relative to the differential diagnosis, we must take under consideration the following pathologic processes: Gummata, which are undergoing destruction, carcinoma of the esophagus, tubercular growths especially, chronic abscess of the tongue, suppurating cysts and, finally, cysts. In all of these processes, however, the clinical picture, the history and examination of the lymphatic glands of the neck, and the microscopic examination which will give the characteristic yellow grains in the pus, will clear up the question of differential diagnosis absolutely.

Generally speaking, the prognosis of actinomycosis is not favorable, and this is especially true where the internal organs have become affected by metastatic processes, which may occur either in the brain, pleura, kidneys, liver, heart, lungs, etc. (Hesse). The prognosis is worse in cases of the lower jaw, larynx and esophagus, where there is inclination for its extension to the mediastinum. In cases of actinomycosis of the base of the tongue, where the process is circumscribed and, therefore, operable, the prognosis is more favorable. I may note in passing, that in one of my cases of actinomycosis of the larynx, paralysis of the recurrent nerves of the corresponding side followed.

The treatment of actinomycosis occurring in the upper respiratory tract is primarily surgical in nature. Careful curetting or excision of the pathologically changed tissue is called for. Some authorities recommend the application of a 5% solution of carbolic acid, and 1 to 1000 bichloride (Korff); the application of $\frac{1}{2}$ to 1% methylviolet is recommended by Raffa, and nitrate of silver fused on a sound and introduced into the fistulous opening is used by Kœttitz. Finally, there are many adherents to the administration of potassium iodid internally, by which they seem to obtain recovery without operation. Among those who employ this method of treatment we count Lissa, Claisse, Bérard and Heryng.

Besides the already described mycosis occurring in the upper respiratory tract, i. e., mycosis leptothricia, mycosis sarcinica, and the actinomycosis, we meet with various kinds of moulds.

The principal ones of these are classed under the hyphomycetes, aspergillus, mucor, and the oidium, and finally the rarer form—the penicillium. In the botanical sense these differ only from each other by the method in which they form their

spores; as, for example, the mucor, where the fruit-carrying threads arise from the entangled mycelium bearing a little bag (the sporangium) in which are the spores (conidia). In the aspergillus, however, the fruit-carrying thread is thickened in the form of a mace to whose surface small "sterigmata" adhere, carrying the spores (Fig. 2). In the oidium variety the spores adhere directly to the fruit-carrying thread (Figs. 9 and 11). Finally, in the penicillium the fruit-carrying thread has ramifications very similar to small pencils on which the spores are formed. (Fig. 8.)

Among the various kinds of aspergillus and mucor observed in the respiratory tract, there have been found aspergillus fumi-

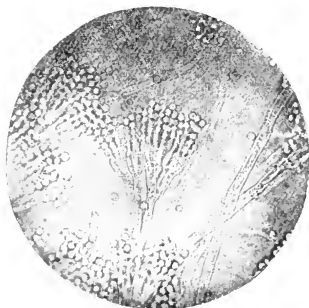


Fig. 8.

Penicillium glaucum.

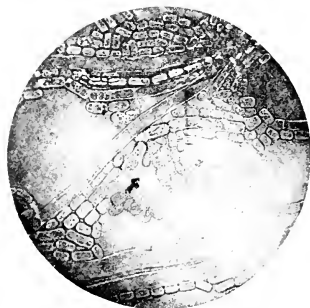


Fig. 9.

Oidium albicans.

gatus, glaucus and nigrescens, as well as mucor corymbifer and niger, the latter of which is the cause of the "black tongue" (Cixlinski, Hewelke); finally, penicillium glaucum is also found. The most important of all the pathologic mould parasites is the oidium albicans, the o. lactis (Robin)—the cause of "soor"—French, muguet—English, thrush. To this class certain varieties of yeasts also belong (blastosaccharomyces), as was demonstrated by the more recent investigations of Busse, Robinowicz, and especially by San Felice. (Fig. 10.)

The best method of examining these moulds under the microscope is as follows: A small quantity of the material is put

in a drop of glycerine on an object glass and divided into very small particles by means of needles. It is then covered and examined with a strong dry lens. Coloring of the specimen is unnecessary, unless examined in tissues, when the method recommended by Weigert should be followed out.

The above-named moulds develop best at a body temperature. They grow best on sterilized bread cultures. Recent observations have shown that *aspergillus* and *oidium* are not substantial forms. The *aspergillus* is only a form of fruit-carrying variety of the *Eurotium*, while *oidium* is the conidial form of *Erysiphe*. The last named, as well as the *Eurotium*, belong to the *Ascomycetes*.



Fig. 10.

Yeasts (dregs) of beer.



Fig. 11.

Oidium albicans (fuchsin).

IV. MYCOSIS ASPERGILLINA.

This variety of mycosis in the upper respiratory tract is rarely seen. The cause of this undoubtedly is due to the peculiarity of these organs. For example, in the nasal cavity the obstacle to the development of this parasite is the constant current of air passing through the nares (Deile), as well as the constant bathing of the nasal mucous membrane in its natural secretions; further, the existence of purulent microorganisms (cocci) are inimical to the development of these parasites, and finally, the temperature of the body is not a suitable one for their development. In the pharynx, however, a

poor development of the aspergillus takes place on the mucous membrane covered with mucus; it also occurs on ulcerated surfaces where the secretions are fetid (Siebenmann).

Persons working in tanneries, or those dealing in leather, are predisposed to this disease, as leather is an excellent medium in which the development of the aspergillus occurs. In general, this parasite occurs as a saprophyte, and is a habitant of living mucous membrane.

In the upper respiratory tract we meet with three varieties of aspergillus—*fumigatus* (the most frequent type), *glaucus*, and *nigrescens*.

There are only 8 publications on record, from which I quote *lus fumigatus* in both nasal cavities in a case of *ozena*.

1. The case of Dunn of Richmond, who two weeks after the cauterization of the nasal septum with chloroform, found a scab covered with brown-yellowish substance looking like fruit-jam, which under the microscope proved to be *aspergillus glaucus*.

2. Case of Delic of Leipsic, who found on autopsy *aspergillus fumigatus* in both nasal cavities in a case of *ozena*.

3. The case of Mackenzie of Baltimore, where in a patient suffering with empyema of the antrum of Highmore, the patient expelled some of the membrane of the sinus, on which there was found (under the microscope) *aspergillus fumigatus*.

4. Zarniko's case: This was an analogous case to the above—a woman 50 years of age with empyema of the antrum of Highmore—the findings were *aspergillus fumigatus*.

5. Schubert's case: A badly nourished woman 75 years of age, whose nasopharyngeal cavity was filled with a dark brown-green mass appearing clay-gray externally, with symptoms of total nasal obstruction, and who expelled a cast from the nose and nasopharynx, which, under the microscope, showed the external layer to be composed of degenerated mucous corpuscles and flat epithelium, while centrally the mass gave evidence of the presence of *aspergillus fumigatus*.

6. Siebenmann's case, wherein the fold of the pharynx of an old woman was covered with scabs, which were composed mostly of *aspergillus fumigatus* and *a. nidulans*, as well as *mucor corymbifer*.

7. Dick's case: A young healthy man, who showed between the arches of the faucial tonsils tufts of corneous substance of a blackish color, which, under the microscope, proved to be *aspergillus nigrescens*.

I must note in passing that Guarnacia of Catania (Sicily) observed 3 cases of otomycosis aspergillus (cause—*aspergillus niger*), which were cured by the use of hydrogen peroxid (with 20 % oxygen).

M. Schmidt observed *aspergillus fumigatus*, as well as *glaucus*, in the nose of a case with atrophic rhinitis.

V. MYCOSIS MUCORINA.

Mycosis mucorina in the upper respiratory tract occurs rarely. It appears in two forms:

1. Mycosis dependent on the *mucor corymbifer*.
2. Mycosis depending on the *mucor niger*—the more usual form.

The first form was observed by Paltauf of Vienna. A patient, 52 years of age, was suffering from enteritis and peritonsillitis circumscripta, with fever, cough and swelling of the spleen; the patient had icterus, as well as affections of the sensorium. After 14 days death took place, and the autopsy showed, among other things, phlegmon of the pharynx and larynx which, microscopically, was found caused by *mucor corymbifer*. The case of Siebenmann, mentioned above, also belongs in this category.

The second form—mycosis mucorina nigra—occurs oftener, according to Cixlinski, Hewelke, Sendziak and Schmiegelow. It forms the essence of the so-called "black tongue." We understand by this term the pathologic process characterized by the appearance on the superior surface of the tongue in the neighborhood of its base, in front of the *papillae circumvallatae*, of more or less extended discoloration—generally black, sometimes brown (Sendziak), or even yellow (Dinkler)—of an irregular oval form, or triangular, with an even, or more frequently, an uneven hairy surface. The process may be acute, lasting two days, or it may be chronic, lasting months and even years.

The disease is not as rare as it was formerly supposed, and we meet with it recently quite frequently in literature. There are about 50 articles on the subject, the greater part of which are English; then come the French and the German. Personally, I have seen 4 typical cases of "black tongue."

The English writers on this subject include Stocker, Broatch, Brydon, Barnes, Balfour, Graham, Masters, Smith, Lediard, Lake, Potter, Abercrombie and Semon; in America, Levisieur, Lohéac, Maraval, Goodale and Johnson have written; in France,

Villar, Surmont, Wollerand, Lannois, Robert, Lecocq and Weil; in Germany, Schech, Bernhardt, Brosin, Dinkler; in Austria, Roth; in Poland, Rydygier, Cixlinski, Hewelke and Sendziak; in Belgium, Massoine and Parmentier; in Holland, Sell; in Denmark, Schmiegelow, and, in Russia, Gundobin.

What is the essence of the "black tongue?" Its etiology is not quite clear. We only know that it occurs more often in men than in women. (All of my 4 cases were males.) It seems to occur at a more advanced period of life—between 40 and 70, although it may occur in children. Gundobin's case was a child 1½ years old. Of my patients, the youngest was 30 years of age.

Some authorities (Cixlinski, Hewelke, Sendziak, Roth, Robert, Vollmer, Maraval and Parmentier) believe this disorder due to the abuse of tobacco, which I noted in all of my 4 cases. Others (Gundobin and Lohéac) hold that it comes from disturbances of digestion and acidity in the mouth. In one of my cases, a patient 30 years of age, the whole body, but especially the breast and shoulders, were covered with abundant hairs. In another of my cases, gastric disturbances were noted. In Lediard's case, there was present simultaneously with it cancer of the tongue; in Bernhardt's case, *tabes dorsalis*; Vollmer's case, *stomatitis mercurialis*; Sendziak's case, *myelitis*; Masoni's case, *tuberculosis*; Lohéac's case, pregnancy, and again in Sendziak's case, spasms of the esophagus.

Dinkler observed the occurrence of black tongue following scarlatina.

Etiology: Most of the authorities, of whom I name Rosenberg, Bresgen, Schech, Brosin, Surmont, Wollerand, Rydygier, Stocker, Levisseur, Masoni, Potter, Vollmer, Goodale, Wingrave, Augier and Johnson see in the pathologic process a hypertrophy of the epithelium of the filiform papillæ with secondary cornification (hyperkeratosis—Brosin, Schech). The dark color of the tongue seems to depend on the increased corneous pigment in the normal corneous cells, so that the older, harder and dryer the corneous layer is, the darker the discolorations will be.

Although some authorities, among whom are Schech, Rydygier, Wingrave, etc., found on examination various organisms—*leptothrix*, cocci, bacilli, etc.—they regard these as of accidental occurrence, having nothing to do with the etiologic factor of the pathologic process. On the other hand, in one

of Sendziak's cases, where an autopsy took place, the pathohistologic examination of the tongue showed the characteristic traces of "black tongue," or, more properly, brown tongue. There were no distinct changes or hypertrophy or keratosis of the filiform papillæ. At any rate, the idea of the parasitic origin of "black tongue" was suggested long ago by some authorities. Dessoix and Sell regarded this disease as a mycosis, depending on the so-called glossophytions, the parasite showing itself in the form of small oval globes, strongly refracting the light and giving a dark color to the papillæ. (According to Brosin, who observed the case, they were not fully developed mould parasites, i. e., soor.)

Raymond also held to the parasitic origin of the disease. He found delicate spores, round or oval in form, situated on the filiform papillæ. West is also of this opinion. Dinkler found in the sediment on a black tongue closely entangled threads with sprouting excrescences, which were sharply pointed. Roth in 2 cases found very numerous micro-organisms, which he believes depend for their existence on this pathologic process. Lake found rounded spores in cases of black tongue, which he regarded also as the cause of this disorder. Butlin—the author of the best monograph on diseases of the tongue—also holds the opinion that the trouble is of parasitic origin. With this view Launers agrees, and Gundobin, who saw 3 cases, found various parasites—leptothrix, spirochete buccalis, oidium albicans, bacillus subtilis, staphylococcus albus, etc. Again Lecocq, as well as Loheac found leptothrix and spores similar to trichophyton.

All these observations, however, by no means solve the question of the etiology of "black tongue." None of the above named authorities has proven his opinion. Only Dinkler made cultures, and these were without positive results. Cixlinski and Hewelke, in the year 1892, cultivated the mould parasite in acute cases of "black tongue" observed by them. The chronic condition they regarded as the result of cornification of the hypertrophied epithelial cells of the filiform papillæ. They found *mucor niger* of a form morphologically identical with *mucor corymbifer*, but differing from this in the want of pathogenic properties, hence these authorities propose for the acute type of "black tongue" another more scientific name—*mycosis linguæ nigra* s. *nigroties mucorina linguæ*.

Two years later, Sendziak of Warsaw observed two cases of

chronic "black tongue." He cultivated *mucor niger*, hence he believes in the mycotic origin of the disease.

Finally, in 1895, Prof. Schmiegelow also cultivated parasites of variety known as *hyphomycetes* (*mucorinæ*) from 2 cases of "black tongue." They differed a little from the parasites described by Cixlinski, Hewelke and Sendziak; Schmiegelow supposes that the negative results of the bacteriologic examination depend on unsuitably chosen culture media. He thinks the best culture media for this parasite to be a composition of white bread and gelatine kept at a temperature of 21 degrees C. At 37 degrees C. this parasite does not grow.

Regarding the etiology of "black tongue," it is somewhat analogous to *mycosis leptothrix*, which, as already shown, is regarded by some (Siebenmann, etc.) as a hyperkeratosis, but by the greater number, as caused by the *leptothrix buccalis*. I regard "black tongue" as a mycosis, caused by the *mucor niger*, which I successfully cultivated in two cases. (Figs. 12 and 13.)

The course of "black tongue" is generally acute (Dinkler, Cixlinski, Hewelke, Gundobin), sometimes it runs a chronic course (Sendziak and Gundobin). In all my cases the course was chronic.

The symptoms differ; a bad taste in the mouth (Sell), sensation of a foreign body, salivation, burning, diminution of the mobility of the tongue are the more common symptoms. Sometimes there is an entire absence of symptoms, as was observed in one of my cases.

The diagnosis of "black tongue," thanks to the clinical picture of hairy black, or brown discoloration on the posterior part of the *papillæ circumvallatæ*, presents no difficulties.

In the differential diagnosis, we must think first of all of *morbus adressoni*, in which there was observed by Fowler bluish-black colorations on the tongue, but here the discolorations were also to be seen in other parts of the oral cavity. One must remember that the application of certain drugs, as well as certain foods, drinks and also tobacco may simulate this disease.

The prognosis of "black tongue" is favorable when the process is not complicated by other serious diseases—Sendziak's case of *myelitis*.

The treatment of "black tongue" consists of scraping away the hairy productions, as well as using alkaline gargles. Brushing with a 5% solution of zinc chlorid, the application of hydro-

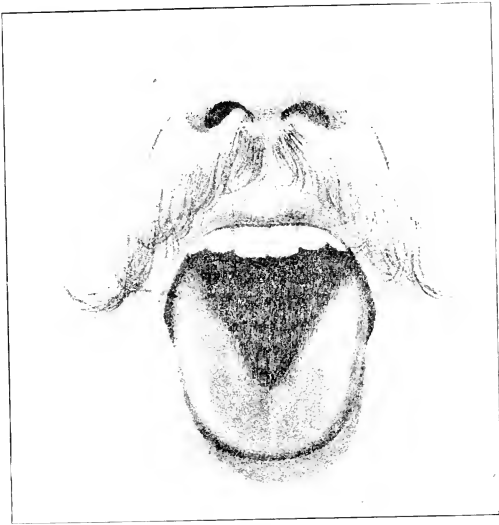


Fig. 12.
(Lingua nigra).

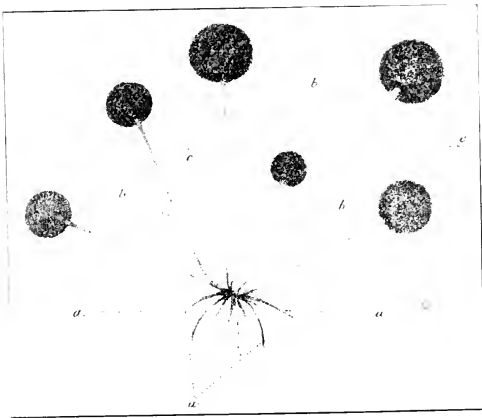


Fig. 13.
(*Mucor niger*) Hartuack 4, oc. 3. From culture on the bread with gel-
atine in the above case.
a. mycelium. b. fruit-carrying threads. c. sporangia.

gen peroxid, 10% solution of bichlorid of mercury are all recommended. 5% salicylate acid, and 10 per cent resorcin are also used. Semon and Unna have employed 5% collodium. Abstinence from smoking is also important—(Maraval's case, in which after the commencement of smoking the disorder reappeared.) In cases where all symptoms are absent, all treatment is superfluous.

VI. SOOR.

(French, muguet; English, thrush)—that is mycosis soorina.

Since the days of Hippocrates, soor was not distinguished from aphthæ. At the end of the 18th century this term was first accepted in France as the definition of a distinct pathologic process. This is the disease "par excellence" of childhood; one meets with it mostly in sucklings, especially in the first days and weeks, but it may be found to the end of the second month in artificially nourished children. Uncleanliness of the oral cavity during dentition, the weak constitutions of the children, as well as the nature of their nutrition, favor the development of this pathologic process.

It is rarer in children over two months of age, although in adults it may occur, according to Thorner, Sendziak, Gage, Oppenheim, Teisser, Tordens, Scheff, as well as Reubold, who saw 50 cases below one year, and only 10 times observed it after 20 years of age. I have seen 4 cases in adults (2 females and 2 males) between the ages of 15 and 70. Mettenheimer reports a case of a female between 80 and 90 years of age.

In adults, thrush occurs during long and exhausting diseases, as for instance, tuberculosis—I had one such case—diabetis mellitus, typhus, gastritis alcoholica. I also saw it in a case of heart disease. Thrush may also occur with parotitis (Dammashino). Finally, thrush has been observed in quite healthy men by Schmidt, Schech, Fränkel, Mlinik, Freudenberg and Seifert.

As a result of acute pathologic processes, thrush occurs less frequently in adults (Forcheimer); Lörü described a case of croupous pneumonia, in which, on the 7th day of the disease, during the crisis, thrush was apparent in the oral cavity, from which it extended very rapidly to the pharynx and larynx. Altman observed and described a similar case. I saw a case in a child 8 months of age. A very interesting case of thrush in-

volving the larynx and nares was observed in a patient 17 years of age, following an attack of influenza; this case was described by Thorner of Cincinnati; Rosenberg saw a similar case following influenza.

Thrush following diphtheria was seen by Sendziak in a girl 15 years of age. The disease was also seen to follow meningitis, morbilli (Reubold, Sendziak) and scarlatina. I have seen thrush appear on the 6th day after hard instrumental labor. Thrush may occur as an endemic disease in hospitals.

There are many papers on this subject, the majority appearing in France and Germany, but America, Italy, Poland, Holland and Spain also furnish their quota.

Etiology: At the time of Robin's writing, thrush was regarded as caused by *oidium albicans*—*o. lactis*. At present we believe differently, namely, that it is caused by *mycoderma vini* (Grawitz), *saccharomyces albicans* (Rees), and *endomyces albicans* (Vuillermier).

According to Plaut, *oidium albicans* is identical with *monilia candida* (family, *terulacæ*); Vuillermier numbers it with the "ascomycetes" having characteristic spores, and calls it "*endomyces albicans*." In general, the position of this parasite is undecided.

Infection takes place from ingested objects, from nipples, and less frequently from the air, or the infection takes place during the phenomenon of partus.

Pott connects this trouble with epidemic pharyngitis of cows, the infection being carried by means of the air. Klemperer showed that after the injection of pure culture into the veins of a rabbit, general mould mycosis appeared. Stoos and Grassed agree with his views.

Thrush localizes itself to the oral cavity, the tongue being specially affected (Butlin), principally along its edges and tip. The papillæ are often prominent as red points here, as well as at the base (*tonsilla lingualis*—Seifert). The frenum is also occasionally affected, while the internal surface of the lips, the *angulus oris*, the gums and cheeks are also not free from the lesion. The tonsil is rarely the seat of the lesion, although in my cases these were often affected. From these localities the trouble extends by contiguity of tissue downward to the pharynx and esophagus (Virchow, Wagner, Schmidt, Langerhaus and Mackenzie). The last named observed three cases of primary thrush of the esophagus. Zalesky observed one in the

stomach. That it occurs in the larynx, trachea and bronchi, the cases of Schroetter, Massei, Fasane and Sendziak prove.

More rarely it extends from the oral cavity upward to the naso-pharynx involving the pharyngeal tonsil (Thorner). It may spread to the ostium tubarum and fossæ Rosenmuelleri, as shown by the cases of Valentine, as well as my own observation in two cases.

An opinion existed formerly that thrush only developed on mucous membrane, whose covering was of the flat epithelium variety (Berg, Reubold, Butlin, Solis-Cohen, Jules, Semon), cylindrical epithelium not being considered favorable to the development of this parasite. In those cases where it did spread, it was considered as a simple (accidental) extension without really involving the mucous membrane. Against this belief, there are, however, the following facts: the extension of thrush to the mucous membrane of the inferior turbinate bodies, as well as to the septum in cases of hereditary cleft palate, and the extension of thrush to the windpipe, covered with cylindrical epithelium. The cases reported by Siebenmann, Sendziak, Thorner and M. Schmidt, where the localization of thrush was confined to the nose, as well as the larynx—the lining membrane of which is cylindrical—also contradicts this theory.

Clinical Picture: Thrush occurs as small, round, white spots, with small excavations in the center, easily removable at first, later, as the disease progresses, more adherent. These spots coalesce irregularly, forming a sort of membrane of a dirty color, the underlying mucous membrane being red and swollen.

The slighter forms of this disorder last only from 1 to 4 days. A severer type exhausts the patient, the whole oral cavity being covered with strongly adherent membrane, removable with difficulty, and followed by hemorrhage.

The underlying mucous membrane being swollen and red in the acute type—the angina soorica of the French authors—may change to a chronic character, then the mucous membrane loses lustre, becoming bluish, flattened, thickened papillæ of atrophied epithelium.

Symptoms.—The suckling children fail to get sufficient nutrition on account of the pain, they become restless, breathe with difficulty, push the tongue forward, the power of the voice is weakened, exhaustion supervenes, vomiting takes place, the stools are green, evidencing gastric catarrh.

In adults the symptoms are less severe. Massei and Fasane saw symptoms of suffocation from the mould-masses in their cases. Sometimes there is absence of all symptoms (Sendziak), at times simply a burning and dryness in the throat, as well as difficulty in swallowing (Kronenberg).

Oidium albicans is characterized by the existence of small white threads, with double lines and transverse divisions (mycelium) ending in bulbs (sporangia) as well as rounded spores. In the membrane we find detritus and epithelium cells. The sections of tissue sometimes show the penetration of the threads deeper into the submucosa, where there are symptoms of reactionary nature.

Differential diagnosis between thrush and particles of food, or component parts of milk are easily made. Between thrush and aphthae we note that aphthae are not so round and have not so regular a form. Diphtheria sometimes shows a resemblance (Schadenwald), but the absence of fever, except in cases of soorica angina, will help to clear up the diagnosis. There is also a less compact membrane and the situation of the membrane itself is of help. From syphilitic plaques it can be differentiated by the concurring skin and lymphatic gland lesions.

Prognosis.—The prognosis is not always favorable, especially in small children where complications easily occur (gastro-intestinal trouble). General infection is also possible (Hubner).

Pürcheimer saw paralysis of the esophagus following thrush. In one of my cases death occurred from acute pneumonia.

Treatment.—The best method is to observe a strict prophylaxis; to keep the nipples clear and systemic cleansing of the oral cavity also are very important. Grozs of Buda-Pest advises the use of 10 per cent silver nitrate in the oral cavity the first day after birth.

Cleaning the mouth in all cases of intestinal catarrh in children and adults is recommended. General treatment is also important.

In many cases local treatment is unnecessary, especially in adults (Sendziak). In children carefully rub the thrush spots with plugs moistened with a weak solution of boric acid. Escherich recommends a solution containing pulverized boric acid

and a little saccharine. Of other drugs, the following are used in this disease: natrium biboricum (3-4 per cent), kali chlor., kali hypermanganicum 0.4 per cent (Schadwald), natrium bicarbonicum 5-10 per cent, lig. alum. acet. pur. (Saltman), sublimate sol. 1:1000 (Kraus), acid carbolicum, naphthol (Cattaert), and finally drugs mixed with glycerine are recommended by Boinet.

In serious cases brushing with kali. iod., sublimate sol. 1 per cent, silver nitr. 5 per cent, pyoktanin 10 per cent, hydrogen peroxide, and finally ferrum chlor. are recommended.

Where the esophagus is affected, the internal application of kali. chlor. are indicated. This must be done carefully. Vichy and emetics may also be given, but caution must be observed for fear of paralysis of the heart. Finally, rubbing the parts clean by means of esophageal sponges may be attempted.

As I have already mentioned, according to the latest researches of the Italian School, of whom San Felice is probably the head, the mould-parasites (*oidium albicans*) belong to a certain degree to the yeast-parasites (*blasto-saccharomycetes*).

They rarely occur in man, as a pathogenic agent causing a special kind of mycosis.

The two cases described in French literature belong to this category.

1. Parak's case, where on the fourth day following birth, there appeared on the base of the tongue white spots (thrush?) which under the microscope were supposed to show not the *oidium albicans*, but a variety of the yeasts.

2. Troisier's and Achaline's case, which were analogous clinically with angina soorica in a typhoid patient, but the microscopic examination also gave a variety of yeast similar to that found in beer-dregs.

Finally there exists in literature some cases of mycosis of the upper respiratory tract which are of uncertain origin and which I report to complete the whole picture of these disorders.

1. Solis-Cohen's case of mycosis of the pharynx of uncertain origin during the course of rheumatic angina.

2. Klamman's case, cited by Schech, grey-yellow membrane on the posterior arch as well as on the uvula composed of mycelium and cocci (the threads having mace-like ends).

3. Hall's case: mycosis fungoides of the pharynx and larynx (arytenoid cartilages) in a patient 52 years of age, and finally

4. Hallspeen and Jeanselmes's case with autopsy, mycosis fungoides of the left posterior arch, tonsils, faucial as well as lingual, aryepiglottic folds, epiglottis, and vocal cords.

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XXXVIII.

REVIEW OF MASTOID CASES OPERATED IN AURAL SERVICE OF BOSTON CITY HOSPITAL, OCTOBER, 1903, TO MAY, 1904 (Inclusive).*

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To the Aural Department of the Boston City Hospital is given the care of what cases are admitted to its service in the main hospital, also the care of those aural complications which may arise in other patients both in the main hospital and in the contagious department. From October 1, 1903, to May 31, 1904, at the main hospital, and from the same date through the summer of 1904 at the contagious department, the service was exceptionally heavy as to numbers of cases, and also included some of more than ordinary interest. Of cases coming to mastoid operation during this period there were in the main hospital forty-two cases (one having a double mastoid) and in the contagious department twenty-four cases (three having the double operation). Thus there were seventy cases of mastoid operation in the aggregate. In these there were but three deaths; one from cerebellar erosion or superficial subdural abscess, one from meningitis with acute cerebral edema probably (no autopsy allowed), and one case of diphtheria, in which pneumonia developed and was the cause of death one week after operation. The ages of these patients were between thirteen months and forty-six years at the main hospital; and between about ten months and twenty-eight years at the South Department.† At the main hospital there were twenty-one males and twenty-one females; at the South Department nine males and fifteen females. At the main hospital the right side was operated twenty-four times, left seventeen, both sides once, and one not given. Among the contagious cases, right fourteen times, left seven and both three.

It is interesting and instructive to note how frequently

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† The South Department is another name for the contagious department.

the classic symptoms were absent so that in some of the cases with no redness, swelling, nor marked tenderness, the mastoid process was found nevertheless full of disease, and here at the main hospital there were twenty-four cases of acute discharge (in which it was induced by paracentesis of the drum-head eleven times) where pain was absent three times, edema seven times and bulging of the posterior wall nine times;) while in four cases both superior and anterior wall were bulging in addition to the posterior, and in three other cases the superior and posterior wall, bulging into the lumen of the canal.

Among twenty-four cases in the South Department there were eighteen cases of acute mastoiditis. These were almost all accompanied by the ordinary symptoms of redness, edema, tenderness and pain as is usual, but in three patients (two being children, aged twenty-two months and three years respectively, and the other a woman twenty-eight years of age) there was, on admission, an absence of pain, temperature, tenderness and swelling over the mastoid. One of them only had a bulging of the posterior wall, but two had bulging of the superior wall of the canal. This woman of twenty-eight years of age, a case of measles, had no affection of the ear till suddenly pain with probably effusion occurred in the left middle ear with a swelling of the mastoid almost immediately. Her maximum temperature was only 102° . She was seen about noon and was ordered to be prepared for operation in the evening. At that time there was congestion and a slight bulging of the drum-head with marked tenderness and swelling over the mastoid; temperature 102° . At the evening when she was brought to the operating table, her temperature had diminished to normal, there was only a slight congestion of the drum-head and but a slight tenderness on deep pressure over the mastoid. There was doubt as to whether an operation would be necessary, but as she had had the symptoms mentioned it was concluded that that meant mischief, and as involvement of the ear in measles has been found to be especially treacherous, it was deemed best at least to ascertain whether there was anything of importance in the bone or not. The usual incision was made, the periosteum came away with great ease revealing a roughened bone surface with a small perforation leading through it into the mastoid cavity, the periosteum evidently having been separated

from the bone and then unaccountably replaced. The cortex was removed with a sharp spoon, the cavity found to be full of granulations bathed in pus; and the whole interior was thoroughly cleared out, irrigated and packed. The others were cases of scarlet fever and showed a similar absence of the usual signs of mastoid involvement. These cases point the argument that we cannot always tell from external symptoms how much destruction is going on where suppurative conditions have attacked this region in the exanthemata. From these and from other experiences in the same line it seems to us to be the best plan to operate on mastoids which have shown during the current exanthematous disease symptoms of acute involvement, even though they have apparently been allayed.

This brings up the question of the efficacy of the use of the ice-bag in acute involvements. In cases in the main hospital it is the routine procedure when tenderness appears on the bone to use the ice-bag not longer than forty-eight hours lest it mask the symptoms and give us false sense of security while the disease may be progressing. After this length of time it is left off and usually if the pain and tenderness recur it may be tried for a few hours longer, but generally it is considered that the operation should be performed especially when the second recurrence of edema makes it manifest that there is pus in the deeper tissues. In the South Department, on the other hand, where there is a marked virulent infection, if the temperature keeps up, the ice-bag is not relied upon to abort the disease, but with the other symptoms, or even in the absence of other symptoms, with a history of acute inflammation, even if they have subsided, as mentioned above, the operation is advised in every case; and it must be further said that in the great majority of cases, probably in all of them, are found conditions of which it would be futile to expect resolution.

Among the nineteen chronic cases there were seven with pain, ten with tenderness, thirteen with external edema, fourteen with bulging of the posterior wall; the superior wall was sunken only three times and the anterior but twice. And it is very significant that in six cases where there was neither pain, tenderness, nor bulging of any inner walls, there were found pus and granulations in the mastoid process, and in three of those the lateral sinus was, or had to be, exposed, because of a carious inner cortex, and in four only was a

sclerotic or eburnated bone mentioned. Of these nineteen chronic cases only four complained of headache on admission, and only five had a temperature of 100° or over, only two having 102° , and one of these was the case of cerebellar abscess, to be further mentioned. Of the other four cases two only had an external cellulitis; and two had probably slight septic absorption, as the inner cortex was carious or absent.

In all of these chronic cases except two there was a history of pain before admission, and in one other the history is doubtful. But in all of them at the operation were found granulations in the mastoid antrum, and in the mastoid process unless it was sclerotic, and in most of them free pus. Hence the symptom most significant in these cases of chronic purulent middle ear catarrh is the discharge. The middle ear cavity is very small, probably not large enough to contain more than a very few drops of fluid. If there is enough to run out into the external ear or auricle, or even to run down on the face or stain the pillow at night, it is reasonable to suppose that there is more chronic inflammatory involvement than of the middle ear itself; *i. e.*, that it extends upward and backward through the aditus and involves the antrum. Nor is a copious discharge only significant of deeper involvement. It may also happen that the slight amount of discharge, which is not sufficient to run out but only to remain in the fundus of the canal to decompose and become foul, being in a deep warm narrow canal, is also significant of continuous caries which may insidiously extend deeper and deeper into the cellular mastoid process, to suddenly appear on the inner cortex and there to set up a localized meningitis, or a mild pyemia from absorption through the walls of the lateral sinus. It will be seen from the above that the chronic cases, especially those where the discharge is not sufficient to be obtrusive, are in a more or less dangerous position, if the presence of the usual conventional symptoms are relied upon exclusively, as the only one noticed may be pain which is so often disregarded or treated at home (which is frequently the same thing) by external applications, or what is far worse, by dropping into the external canal certain abominations such as laudanum, sweet oil, hot onion hearts, etc.

It is well to call attention here to one of the reasons for opening the mastoid given by Sir William Macewen, at the

International Otological Congress at London in 1899, because he clearly showed the weight of certain symptoms in cases of chronic purulent discharge, which may have other interpretations; and the evidence of which was only elicited in some of our cases by careful investigation, because such symptoms are usually not attributed to the ear, and also because of the rather obtuse intelligence of some of the patients who are unaccustomed to very carefully observe their mild sensations.

He says: "The pyogenic process may, however, proceed inwards, giving rise to symptoms often misunderstood or attributed to other causes, and may eventually prove fatal or, by undermining the constitution, thereby pave the way for the advent of other lesions. Many patients thus affected, though able to pursue their usual avocations, are yet subject to periods of malaise, with occasional recurrent slight febrile attacks; irritability and nervous hyper-sensitiveness exhibited in unevenness and irascibility of temper, which attacks last from a few days to a week or more, leaving the patient slightly weaker, though relieved from the depression and fit to enjoy life. These attacks are so frequent, and the patient becomes so used to them, that he comes to regard them as a part of his ordinary habit, and often attributes them, with considerable plausibility, and sometimes with point, to colds, chills, biliousness, indigestion, etc."

Hence it will be seen that there is a certain line of cases demanding operative interference where symptoms consequent on slight suppuration are very obscure. The assistance of the thermometer here is very marked, since during these chilly states, or when the patient is suffering from malaise, it may show a slight elevation which may be transient and occur at irregular times of the day. If it were possible, it would be advantageous to have blood counts made at these times, but as yet such opportunities have not presented themselves.

In the twenty-four cases at the South Department there were five (one being double) where there was a chronic discharge before entrance. These cases, of course, were excited into acute exacerbations by the exanthem from which they suffered, and hence the obscure symptoms mentioned of those cases occurring without this complication in the main hospital were masked, and they all had the ordinary classic

symptoms of pain, tenderness, mastoid edema, and bulging of the walls, which are found in cases of acute mastoiditis; and here also at the operations were found carious bone and pus and granulations in the mastoid processes, the same as in the other chronics; but in none of them, as they occurred in younger children (all being under seven years of age) was the inner cortex found to be softened or absent.

The exceptional success in these cases in respect to mortality is probably due principally, in the minds of the operators, to the fact that all of the diseased tissue was removed, every vestige of carious bone or purulent infiltrated or inflammatory tissue wherever it extended was thoroughly scraped away, so that the mastoid process itself was almost invariably left as nothing but a very thin shell. This cavity was packed and allowed to granulate in most of the cases, both acute and chronic. A few radical operations were done and these were grafted in the usual manner with skin removed from the inner aspect of the thigh above the knee, but there were ten cases (nine in the main hospital and one in the South Department) allowed to fill up with blood clot, and the wound sutured immediately. Of these cases one in the main hospital, a feeble-minded, ill-nourished individual of three and a half years of age, broke down in twenty days, and two others sloughed within a few days; and one, a well-nourished woman twenty-three years old, who had the double operation, left the hospital and within a month it was reported that her left mastoid had sloughed. One in the contagious department was a case of measles where the clot also broke down. It seems, therefore, that one-half of the cases were successful and that these have not given trouble so far as known. It may, therefore, be asserted from this and subsequent experience that this procedure of Dr. C. J. Blake's sometimes produces a very quick cure after the mastoid operation; and also that even when the clot breaks down, that part of it which lies contiguous to the bone surface furnishes quick and satisfactory nourishment for the new granulations, and for the new growth of osteoblasts, so that they have been very much hastened and therefore the length of time for healing very much diminished. Moreover, in some cases where the granulations seem to be sluggish, flabby, pale and ill-nourished they have been bruised and the blood clot allowed to remain, *i. e.*, they have been dressed in their own blood, as it were, and in these cases

the healing has evidently been accelerated.

The length of time during which patients have remained in the hospital varied very greatly, from nine days after the clot operation to one hundred and fourteen days, the latter having been caused by many complications. Some of these cases have also had to be operated upon a second time because of the spicules of carious bone which may have separated subsequent to the operation, or because plastic operations have been necessary.

Among these cases were four of the Bezold variety with pus infiltration down the neck through a fistula in the digastric fossa. One of these was operated in one of the surgical services for a deep abscess in the neck and afterwards transferred to the aural service to have the *fons et origo mali* removed, which was done by the thorough removal of the mastoid process except the inner shell. The other three cases were operated on as for an ordinary mastoid except that the inner cortex in the digastric fossa was removed, exposing the insertions of the muscles in this vicinity and the tract of pus exit probed, and the pus pressed upward from below when it was indicated. This procedure was found in each case to be sufficient for drainage and the cellulitis rapidly subsided, in no case necessitating any operation in the neck. This would seem a priori to be insufficient as a surgical measure, but when it is remembered that the patient is in the recumbent position for a number of days, it will be seen that the pus, seeking its easiest passage, has the assistance of gravitation almost all of the time; and that this, assisted by the natural contraction of the muscles and tissues of the region, is evidently sufficient to drain the abscess, even though in an upright position, it is dependent.

In addition to this general review the following cases present some points of interest and are herewith reported more or less in detail.

Case. 4. Otitis media purulenta chronica with cholesteatoma. Complete exenteration. Four operations. Eighty-two days in hospital. Discharged well.

Edw. C., fifteen years. Admitted November 16, 1903. Has had purulent, odorous discharge from right ear for many years, of which the history as also that of the pain are indefinite, till ten days ago when an acute exacerbation seems to have taken place with great pain and swelling behind the

ear. On admission, temperature 98° with pain in and around the right ear, tenderness and edema over the mastoid process.

Operation on the 17th. Usual incision through the periosteum gave vent to considerable pus and came down upon superficially eroded bone, with carious openings into the mastoid process which was a large cavity with partially absorbed trabeculae between the pneumatic cells, and was filled with unhealthy granulations, much debris, and foul cholesteatomatous masses, some of which were so adherent to the bone as to give the appearance of black stains. The inner cortex was soft, in places absent and the lateral sinus, with a greenish gray opaque wall, lay in the bottom of the wound at completion of the operation, but was soft, yielding to pressure with finger, though not pulsating. Cavity gently irrigated and packed with iodoform gauze, and patient put to bed to await developments, *i. e.*, possible signs of lateral sinus involvement. These did not appear and the highest temperature reached was 101.5° . At the subsequent dressings the newly formed granulations showed that the cholesteatomatous infiltration had not been wholly eradicated, a very difficult process in an old case; and this was not wholly removed by the use of peroxide of hydrogen and strong antiseptics. Hence on the 29th of November under ether a complete exenteration was done, attic, middle ear, etc., all thrown into one cavity and thoroughly curetted. A probe found a dehiscence in the Fallopian canal and caused twitching of the muscles of the right side of the face. The wound was not closed because of the possible recurrence of the cholesteatoma, but was packed with iodoform gauze. At the dressings the wound now appeared clean, and on the 12th of December under ether the granulations were smoothed down and the interior covered with Thiersch grafts. These took quite well and no appearance of this septic epithelial debris resulting, the posterior wound was closed under ether on the 20th of January. Healing was complete and he was discharged well on the 6th of February.

This case shows how much infectious material may be carried around for a long time without apparent danger, and how much trouble there may be in its eradication.

Case. 8. Otitis media purulenta chronica; bloodclot dressing.

F. T., male, forty-six years of age. Admitted January 4, 1904. Measles in childhood; left ear discharged for four years afterwards; right ear began discharging twenty-eight years ago; has had occasional attacks of pain with irregular periods of discharge since.

Examination. Left ear shows cicatricial drum-head, right ear perforated drum-head with marked bulging of posterior wall.

Operation January 5th. Large amount of carious bone and granulations removed, cavity scraped clean as far as the end of the aditus, care being taken not to enter the attic; cavity allowed to fill with blood clot and wound sutured both through the skin and periosteum, a small hole being left below, in which a small wick was inserted to remove the more fluid parts of the blood to insure a firm clot. Healing by first intention; wick removed in about three days; excavated area feeling solid to moderate pressure. Duration of time in hospital fifteen days, but could have been readily reduced to eight. He was, however, detained in order to be sure that there was no immediate breaking down, and was discharged in fifteen days solidly healed and apparently restored to his usual health with the middle ear only slightly moist. So far as known this case has not given any further trouble.

Case 10. Otitis media purulenta chronica. Bezold mastoiditis.

T. M., male, thirty-five years of age; admitted January 16, 1904. Left ear has discharged for a year. For two weeks has had steady pain in the ear and through the head, with some soreness on the right side. Has small dermic swelling of the left auricle, probably eczematous, not due to erysipelas. Temperature on admission 102° . Narrowing of the external canal, especially of the posterior superior, and anterior inferior walls. Considerable pain referred to behind the ear (left) with slight edema and considerable tenderness. It is rather difficult to see whether the narrowing of the canal is due to edema, or to the inflammatory process, although probably both are factors. On account of the temperature and the indefinite history of fever with slight chilliness, blood count was made and found to show 14,000 whites. Examination of the eyes showed fundi normal; examination of the left ear showed an old cicatricial drum-head with perforation, although not easy to make out because of swelling

of the canal. The mastoid process was somewhat swelled, especially in the lower part; this swelling extended one-half way down to the clavicle, very tender to the touch, brawny and tense.

Operation on January 17. Cortex, after removal of the periosteum, bled from many points. The attachment of the muscles was very dark and freely bleeding. Removal of the cortex revealed the mastoid process full of granulations and broken down débris. The antrum was especially full of old fibrous granulations. The bone over the digastric fossa was soft; removed; a small amount of pus was evacuated. Posterior cortex about the same; also removed, exposing the lateral sinus. This case went on to satisfactory healing; the swelling in the neck disappeared, drainage through the mastoid wound being amply sufficient.

Case 15. Otitis media acuta. Mastoiditis. Beginning Bezold. Blood clot dressing. Recovery.

F. M. C., female, twenty-two years of age. Admitted February 5, 1904. With no history of previous ear disease, severe pain began in right ear three days ago. Paracentesis was done at Boston Dispensary. For next two days severe pain in ear, running down neck, with chills, but no marked rigor. On admission temperature 100°. Profuse sero-pus discharged from the right ear. Perforation in lower posterior quadrant, through which the discharge pulsed. The lower half of the mastoid and the upper third of sternocleido-mastoid region were swollen, red, tender and rather stiff. This infiltration was present in right side of the throat, which looked swollen, and opening the mouth was painful and restricted, suggesting inflammatory involvement of the tonsil.

Abortive treatment was attempted, ice bag, hot irrigations, rest in bed, restricted diet, etc., but operation became necessary on the 13th of February. Highest temperature 102°.

The mastoid process consisted of hard bone with small cells, the bone being inflamed and bleeding much. There were few granulations in these cells and in the antrum. The bone was cleared out till it was yellowish white, with no bleeding or oozing spots, and allowed to fill with blood clot furnished by the vessels around the incision through the soft parts and the incision then sutured, a small wick being left

in the lower part. Healing by first intention, and the patient was discharged in thirteen days after the operation.

Contrary to our usual custom this patient was not operated upon immediately, but it is evident that eight days would have been saved if she had been.

In this case also we have the tendency of the suppurative process to point inward, as shown by the marked cellulitis down the neck, even presenting inside, which involved the posterior belly of the digastric muscle.

Case 16. Otitis media purulenta chronica. Facial paralysis. Polypi. Bezold mastoid. Erysipelas. Recovery.

S. H., female, forty-five years of age. Admitted February 26, 1904, a very large, fleshy woman. Her left ear has discharged more or less for thirty-nine years with unnoted pain, but has had no treatment. Five days ago pain was quite marked, with swelling and tenderness behind the ear, and soon afterwards the face began to turn towards the right. On admission, temperature was 100°. Discharge somewhat from the left ear, with polypi filling the whole of the external canal. Behind the ear, much swelling and tenderness, which extends considerable distance down the neck; also above and around the ear, hard, brawny, pitting on pressure, which is quite painful. There is complete paralysis, facial, on the left side. The canal narrowed by edema of its walls but slightly. Eyes examined and slight choroidal atrophy reported with some congestion about the discs.

Operation the same day revealed a good deal of free pus and granulations in the large pneumatic mastoid with peripheral bone easily bleeding. The facial canal and the horizontal semicircular canal were exposed, inflammatory carious tissue being gently scraped away from the region of the former, digastric fossa exposed and sinus leading downward gave exit to a considerable amount of pus. The wound was packed with iodoform gauze. February 29, the temperature rose suddenly and erysipelas developed. Transferred to Ward I, and usual treatment instituted.

March 1. Temperature still elevated, white count shows 36,000.

March 2. Temperature 103° to 105°, rather more swelling down the neck, the wound dressed and quite a large amount of pus evacuated from the fistula through the digastric fossa. After this date symptoms gradually subsided, swelling in

the neck diminished, facial paralysis disappeared, the wound granulating satisfactorily and she was discharged relieved; that is, the wound not completely healed, but to be dressed at the Out-Patient Department, March 22.

Case 20. Otitis media acuta. Mastoiditis. Epidural abscess. Recovery.

Thomas P., twenty-eight years of age. Admitted March 1, 1904. Seven weeks ago began to have pain in left ear, followed by discharge. One week ago tenderness and swelling behind ear, extending forward on to the cheek and down the neck. Considerable headache but no vertigo, nausea or vomiting noticed.

On admission, temperature 100° , with pain in and around the ear with tenderness and edema, and also edema of the bony canal walls, posterior, superior, and anterior. Auricle displaced forward and down. This swelling extended half way forward on malar region and considerably down the neck. There was a perforation through the drum-head and a copious discharge.

In the evening had a marked chill, temperature 103.2° , afterwards moderate perspiration. White count showed 20,000.

March 2. Another chill with vomiting, temperature 103° , to 105.6° . House officer, however, reported only 5,000 whites.

Operation. Purulent collection subperiosteal, rough bone, carious opening into a cavity which took the place of the mastoid bone, and was filled with pus and granulations. The inner cortex was rather soft with loss of continuity, the removal of which revealed an epidural perisinuous abscess, with the inner wall covered with protective granulations. The tegmen antri also easily came away, showing slightly discolored dura.

Wound thoroughly cleaned with hot sterile irrigations gently applied and packed with iodoform gauze. Recovery uneventful. Discharged on March 17.

In this case may be seen what alarming symptoms may be called forth by merely superficial conditions, the thorough removal of which is sufficient to abolish them all. It may be well questioned whether the sinus, covered as it was with granulations, did not admit pus enough to cause the chills and high temperature; and so it might have been considered

that a beginning thrombus, at least a mural one, was in process of formation, and an excavation of the sinus called for, as has lately been advocated under similar conditions.

The result eminently justified the conservative course pursued.

Case 23. Otitis media purulenta chronica, with attic and antrum involvement. Cerebral symptoms. Operation. Recovery.

Ellen C., twenty-nine years of age. Admitted March 4. Seven years ago pain and discharge from left ear. Ceased in three months. Afterwards hard of hearing. Recurrence one year ago, with headache, profuse discharge, chills, vertigo (tendency to fall forward, never sideways), and vomiting. This attack lasted three weeks. After this always had discharge with colds, but no other trouble except deafness. Three weeks ago, following a cold, pain in right ear with headache and soreness of the whole head, with nausea and vomiting on afternoon of March 2 and 3. Paracentesis was done on March 2. Temperature had been between 99.2° and 101.5°.

On admission, temperature 99°. Complains mostly of tenderness and soreness of whole scalp, especially marked over right temporal bone, and over right mastoid tip, which is exquisitely sensitive. Back of neck is sore also, but not stiff. Vertigo is marked on moving head, sitting up or lying down. Photophobia present. Eyes normal, both as to external movements and ophthalmoscopic appearances. Some chilliness during the evening, no rigor. White count shows but 7,600. Examination of ears shows right membrana tympani slightly bulging, swelling most marked in membrana flaccida, with redness of contiguous walls of canal, no discharge. Agglutinated paracentesis opening in inferior posterior quadrant. Canal wall tender and slightly red. Left ear shows absence of membrana vibrans, with profuse whitish sero-purulent foul discharge, suggesting cholesteatoma. Membrana flaccida white, moist, underneath which may be seen a dirty, yellowish substance. Posterior wall red, swollen and tender to pressure with cotton applicator.

Under small amount of ether the posterior segment of right membrana tympani was severed, and two incisions made horizontally in Schrapnell's membrane, one each side of the neck of the malleus. Ice bag to right mastoid and hot irrigations.

March 5. Considerable relief to right ear. Doctors P. C. Knapp and J. J. Thomas, in consultation, opined that there was no meningitis, but possibly an extra-meningeal (pachymeningitis) pressure or involvement of the labyrinth and no localizing symptoms of brain abscess.

March 6. Operation. After removal of periosteum, cortex normally white and glistening, bone sclerosed, especially forward and above, large antrum with hard, gritty walls, full of old granulations, no pus. Thoroughly curetted and walls made smooth, also aditus enlarged, forward and upward, and smoothed well into the attic. Cavity packed as usual. Patient complained of much headache after operation and was very nervous, but aggravating symptoms rapidly subsided and she made an uneventful recovery, and was discharged relieved, after twenty-four days in the hospital, wound nearly healed, and middle ear nearly dry. The right ear gave no further trouble.

In this case is seen what aggravating and truly alarming symptoms may be induced, especially in an intensely nervous woman (though by no means confined to such) by pressure in the attic brought on by slight acute inflammatory conditions, as witness those in connection with the right ear; also how similar disturbances may be brought about by a slight increase in the size of chronic granulations in an old mastoid antrum, the only other evidence of which may possibly be a chronic intractable, recurrent discharge. Cases like this also differ from those so succinctly described by Sir William Macewen, in that symptoms are evidently caused by pressure rather than by absorption.

Case 34. Otitis media acuta with mastoiditis; sluggish infection; much delayed operation; acute cerebral edema (?); death.

Elba C., twenty-seven years of age, a spare Swedish housewife, was admitted to Ward O. (P. R.) with a history taken from private notes. She was sent to me by Dr. F. S. Parsons of Dorchester, March 7, 1904. Never had trouble with ears before except slight ear-ache a year ago which only lasted a day and left good hearing.

Thirteen days ago, "with an awful cold," a regular ear-ache began, very severe for about a week. A blister seemed to give some relief. Thought it was an abscess but it did not discharge, and is now very deaf. At first was very dizzy and

had six or seven vomiting spells. Could not walk for first three days and had to remain in bed. Considerable pain at night, so that she had not slept more than an hour or so. Was sore all over left side of head for a few days and had much pain and tenderness behind ear. First day was chilly; now complains mostly of tinnitus.

Examination shows left membrana tympani very thick, dull red, posterior segment bulging and contiguous parts of canal also red and swollen. A large paracentesis was made, evacuating bloody serum; irrigations every two hours, with sol. corrosive sublimate, 1 : 4000.

March 21. Has been free from pain even at night since last visit. Less tenderness of mastoid. Paracentesis opening discharging yellow pus. Posterior wall of bony canal red and slightly swollen. Membrana tympani much swollen so that the hammer handle is deeply sunken between the two halves. Mastoid operation advised; declined because wishes to return to Sweden for the summer vacation. To use ice to mastoid.

March 23. Ice removed nocturnal pain; but had some pain yesterday, "not to speak of."

March 26. Much pain for two hours last night; but mentions throbbing through the head. Slept last half of the night; only five or six drops of discharge last night and none yesterday at all. No increase of discharge after pain. A. A. S. Three and one-half feet; inflated with Politzer's, A. D.; nine feet. Membrana tympani very red and thick, slight pain after P. A. D. and a small amount of discharge blown out. No visible perforation. Nose free; region of Eustachian mouth treated with astringent solution.

April 2. Has had less discharge; no pain, but headache over eyes for two or three days off and on, but has this pain quite often. Less tinnitus, less soreness of mastoid, membrana tympani very thick, depressed at umbo with small pouting perforation in posterior segment. Hears A. A. S. 20 inches, inflated with Politzer's A. D. four feet.

April 8. Has no more pain but discharges at night a very little. Still slight tenderness of tip of mastoid. Hears A. A. S. five feet; after P. A. D. three or four times, thirteen feet. Still refuses to consider operation, which is urged for safety.

April 18. No pain, slight discharge still but more running at night. Mastoid tenderness back of tip and over antrum. Slight sensation of stiffness on opening mouth.

April 20. Increase of pain in ear. Pouting perforation larger and membrana tympani still very thick. Mastoid quite tender. Large paracentesis. Only blood evacuated. Sent to hospital for operation. Entered same day. Temperature 98.5°. Profuse discharge. Large cut through posterior segment of membrana tympani. Redness and edema over mastoid; canal, posterior wall thick and red. No head symptoms noted.

April 21. Operation. Cortex white, hard, thick; removed; bone pneumo-diploetic, large cavity cleared out with lateral sinus bony wall deep posterior. Many pockets of pus with large superficial air spaces extending backwards almost to the occipital bone and forward into zygoma. Antrum full of pus, granulations and bony spicules. Diseased bone curetted away till horizontal semi-circular and facial canals came into view. External canal and mastoid cavity thoroughly irrigated and wiped out and the whole packed with iodoform gauze.

April 23. Temperature elevated all day, about 101°. Vomited a good deal. No other symptoms suggested intracranial complications.

April 26. Wound dressed, clean, granulating. Temperature 100.2°.

April 28. Temperature 99°.

April 30. Temperature normal.

May 2. Up in chair. Wound clean, granulating, healthy.

May 6. Same report.

May 8. Walked in from an airing out on the bridge between Wards O and D apparently dazed, but seemed to recognize every one, this condition of slight lethargy being attributed to neurosis, or a sudden neurasthenic condition. Pupils equal, react normally. Knee jerks not increased. Tongue normally protruded. Temperature 100°, pulse 84.

May 12. Remains in about the same dull condition. Talks occasionally; rather brighter; vomited twice; complains of headache.

May 16. Improved mentally. Wound clean, granulations healthy, filling in well.

May 20. Mind duller; difficult to form sentences; slight aphasia; cannot tell what she wants; slight headache; vomited once or twice in last two days. Temperature normal. Examination of eyes show fundi normal.

May 21. Slight improvement. Seen by Dr. G. G. Sears, who said the question was between meningeal irritation and exhaustion psychosis, or some other cerebral condition.

May 23. Seen by Drs. Knapp and Courtney, who diagnosed an abscess in left temporal lobe and advised operative exploration.

May 24. About the same lethargic state though answered questions and talked a little. More uncontrollable dark green vomiting. At 11 A. M. dull, listless, twitching of muscles, with whole right side rigid. Temperature 100°. Coma supervenes. After much persuasion husband allows further operation; well set and copious granulations cleared out of mastoid. Incision made three inches upward from mastoid opening, separated, and an opening made above the tegmen with rongeur forceps 1½ inch in diameter. Dura bulged into opening, tense, normal color, not pulsating. Dura opened, brain substance protruded and then began to pulsate very rapidly. Director passed in deeply in four different directions; no abscess contents nor cavity found. Brain then began to protrude rapidly more and more and was very tense. Exploration with finger advised against. Bandage applied with pad, very tightly. Taken to bed. Ten minutes later cyanotic; pulse 150; irregular; and death ensued in about half an hour after operation.

No autopsy was allowed.

In this case we were confronted with the obstinate refusal of an operation when a comparatively simple one would probably have saved the life. Moreover, this is one of the class of cases where the affection of the middle ear seems to be such that vigorous, ordinarily approved treatment seems to be powerless, at least outside of constant hospital care, to abate the results of a rather sluggish infection. That this infection was sluggish seems to be proved by the long continuance of the disease (from March 4 to May 24) without more marked virulent symptoms. It is to be regretted that a bacteriological examination was not made, for after the infection became mixed, it was too late for satisfactory data. It also shows what a dangerous combination is a thick drum-head with a pouting perforation, and a thick, white, ivory-hard mastoid cortex.

Case 36. Otitis media purulenta chronica, with posterior auricular fistula leading to carious mastoid. Operation. Recovery.

Frank W., aged eight years. Admitted February 19. Well nourished and otherwise a healthy boy. Was operated on at this hospital at one and one-half years of age for acute mas-

toiditis on right side. Ear has discharged ever since. Mastoid wound was very long in healing and sinuses have broken out and discharged at intervals ever since, the last one persisting. On admission temperature 98°. No complaint of pain or tenderness but only the persistent, annoying discharge both from the canal and from a post-aural fistula.

Examination shows a large perforation of drum-head. Probe enters a defect in scar of previous operation and detects plenty of rough bone, passing in deep enough to reach the antrum; and, bent, can pass forward into the aditus.

February 20. Operation. Incision through the old scar. Large passage bounded by hard, bony trabeculae leads to antrum which is walled in by hard bare bone, all evidently newly formed bone embedded in soft granulations bathed in pus. A large part of the previously excavated cavity had evidently likewise been filled in with bone. This was scraped away down to smooth, hard bone, the lateral sinus being exposed, and also the horizontal semi-circular and facial canals.

The wound was so clean that it seemed well to dress with blood clot; but the cavity having been so long infected and the middle ear accessible through the aditus, it broke down in four days. The wound was then opened, and cavity packed as usual, but the inner surface of the cavity was well covered with granulations.

March 8. Discharged, nearly healed.

This is reported as an example of a fortunately not common class of cases in which a secondary infection takes place through the middle ear, and when it is considered that this already infected, or from the throat easily reinfected cavity, may not be wholly shut off from the mastoid by a bony or fibrous plug in the aditus, it is not far from strange that this untoward event does not more often occur.

The preservation of every possible amount of hearing is reason enough for avoiding any further destruction in the middle ear, and hence, the risk of reinfection of the mastoid seems to be unavoidable, till some better means is devised for separating the two cavities.

Case 6. Otitis media purulenta chronica. Recurrent mastoid. Chronic superficial cerebellar abscess. Operation. Brain exploration. Death.

John B., nineteen years of age. Admitted December 30, 1903. Strong, well developed and nourished, of good color, a civil

engineer. Of a phlegmatic disposition, rather slow, gave the following history:

Right ear has discharged off and on for six years, exacerbations preceded by pain, and once followed by abscess behind the ear, which was opened by family physician without anesthesia. For the last five years has had occasional attacks of severe pain in right ear, accompanied by fever, and followed by foul discharge for a day or two. The pain, fever and discharge soon subsided. Was on these occasions treated by family physician, who at times opened the abscess (paracentesis?) followed by syringing.

An attack similar to the above began two and a half weeks ago, except that the accompanying severe headache remained general, *i. e.*, was not confined to the right side. Was able to be up and about the house for a few days, during which the headache was so agonizing that he seemed to spend most of the time with his head bowed resting on the table. For a few days before entrance spent considerable of the time in bed. Two days ago temperature 102° . Pain then became localized at the occiput radiating to the middle of the back between the scapulæ. One quarter grain morphia relieved the pain. Three days ago, at 8 P. M., on going to bed was chilly, had some perspiration around the head, but no marked sweating. Took morphia, one-eighth grain, 5 A. M. to-day, and this was vomited immediately. It was then given subcutaneously and repeated at 7 A. M. Vomited again at noon. Was sent then to hospital by Dr. Currie of Cambridge. Has had no dizziness and walked to carriage without support. Admitted at 4:45 P. M., temperature 102° , pulse 100, good volume and tension.

General examination: Lies on his back, legs extended, not restless, knee-jerks normal, no ankle clonus, no Babinsky, no Kernig signs; marked stiffness of neck. Eyes: Movements normal, pupils equal and react to light and accommodation; nose normal; other organs normal; tongue coated.

Local examination: Left ear, membrana tympani thick, otherwise negative. Right ear, a V-shaped scar on mastoid process. No depression, no redness, no edema, no tenderness. External canal reddened at the junction of cartilaginous and osseous portions near membrana tympani; redness and bulging of posterior superior and anterior inferior walls, so that membrana tympani is seen with difficulty. Considerable dry secretion with foul odor wiped away with a cotton applicator,

also some blood showing presence of granulations. Blood count was made by house officer, whites 24,000. Ophthalmoscope showed fundi normal.

Operation 10:30 P. M. Usual mastoid incision exposed rough carious cortex, which was removed with a curette exposing a cavity three-quarters inch deep, three-quarters inch wide, filled with foul cholesteatomatous masses of the consistency of cream cheese and about the same color. The whole of the mastoid was soft from caries and was removed, and a large and free communication was established with the middle ear through the antrum and the aditus. No fistula through the tegmen found, and communication not made. Incision was enlarged one-half inch backwards and upwards, the emissary vein exposed and found healthy. The posterior inner cortex of the cavity removed, and the lateral sinus exposed to the bulb, epidural abscess sought with a probe but not found, sinus wall of dark, opaque yellow color, no pulsations seen nor felt. The wound was irrigated with normal salt solution and packed to await further developments. Patient left the table in good condition. Pulse 90.

December 31, temperature 100° , pulse 70. Expresses himself as feeling better. Rigidity of the neck same, cannot flex the head. At the visit temperature $99\frac{1}{2}^{\circ}$ to $100\frac{1}{2}^{\circ}$. Blood count shows 16,000 whites.

Examination of the eyes shows fundi normal; slight rotary nystagmus observed at 6 P. M., increased by looking upward and outward, more marked to the right. Has pain only occipital, somewhat restless, lies curled up in bed, both knees flexed; cerebation slow.

January 1, 1904. Slightly better and mind more active, prefers to lie on left side with knees flexed. Drooping of upper right eyelid. Slight paresis of external and inferior recti and probably of internal rectus of left. Nystagmus increased on looking upward and backwards over to right. Diplopia. Facial paralysis evidenced by incomplete closure of right eye and less strength of the right side of the mouth. Stiffness of the neck same. Blood count 16,000. Pulse 68 to 80. Temperature 95° to 102° . Fundi slightly hazy at the inner side of the disc. Seen by Dr. Prince, who says either abscess or meningitis.

January 2. Middle of forenoon no change. Wound dressed at 2 P. M. Very foul. Peroxide of hydrogen used. In the

afternoon pupils dilated and react. Right larger than left, other eye symptoms and fundi the same. Pulse and temperature are same. Blood count, whites 12,000.

January 3. At 1 and 7 A. M. and 2 P. M. vomited. Had restless night, complained of pain in right eye, which soon disappeared. Drs. W. N. Bullard and Morton Prince called in consultation and advised exploratory operation. The previous wound was opened; considerable cholesteatoma removed. Incision enlarged backward one-half inch, periosteum elevated. Emissary vein cut. Blood stopped by hemostat. Trephine opening made one inch in diameter behind sinus and below linea temporalis. Button of bone removed. Dura of normal color under slightly increased tension; incised, laid back. Cortex of brain normal. Explored in four directions; downward one inch, backward and inward one and one-half inches each; forward with curved trocar about two and one-half inches. In this direction trocar was not passed further in under advice of neurologist. Mastoid wound enlarged upward upon squamous portion of temporal bone, which was removed with forceps exposing a large area. Dura and brain apparently healthy, explored with sterile trocar in several directions of varying depth. No pus found anywhere. Dura flaps sutured and also external wound except in the first mastoid incision. Returned to bed. Pulse 140.

10 P. M. Pulse improved; four hours after the operation pulse 98, feels well.

January 4. Feels stronger; increasing strength through the day. Pulse 70 to 80, good volume and tension. Temperature 99.2 to 100.4°.

2 P. M. Vomited; cerebation sluggish.

4 P. M. Complains of very severe pain in occiput. Morphia, $\frac{1}{4}$ grain subcutaneously. Afterward slept very well, respiration 20 to 23. At 8 P. M. temperature 102° and remains so until next A. M.

January 5. Temperature 99.4°. Pulse 78, feels well. Pupils equal, normal, no nystagmus, resting quietly. Under primary ether, wound dressed at 2 P. M., dressing moist, no pus, some oozing of blood from the middle ear, and depth of the mastoid had foul cholesteatomatous odor. Dura and sinus wall in good condition, no change from when first exposed. Some necrosis of skin flap edges. Irrigated and packed with iodoform gauze. Patient was delirious during the

next hour, crying with pain in his head. Was given morphia $\frac{1}{4}$ grain, which was repeated at 7 P. M. Pulse 80 and temperature 101° at 9 p. m.

January 6, 12:30 P. M., rather restless; slightly delirious yet recognizing people. 9 A. M., could not be aroused. Under homatropin Dr. Bossidy reports optic neuritis in both eyes. From this time gradually failed; became cyanotic at 11 P. M., respiration 6 to 8 per minute; pulse very rapid; unaccountable; and at 11 P. M. *exitus letalis*.

Without giving the findings of the Pathological Department in detail, the autopsy showed on the anterior outer surface of the right cerebellum an erosion of the brain or superficial abscess, intra-dural, of about 1 inch in diameter, $\frac{3}{8}$ inch to $\frac{1}{2}$ inch in depth. The sinuses made in the exploration by the trocar were not visible except the long one which went forward $2\frac{1}{2}$ inches, which was shown as a fine red line with normal brain substance round it. The end of the puncture stopped $\frac{1}{8}$ inch before reaching the abscess. It is probable, however, had the abscess been reached, on account of the large amount of brain destruction, and also of the fact that there was no pus under pressure to be removed, and also because the tract for its evacuation would have been so long that the discovery of the abscess would have made no difference in the condition of the patient.

In this case the abscess was probably latent for a long time, possibly for years. The infection doubtless made its way through the labyrinth.

Case 41. Bullet wound of the right ear, probably self-inflicted. Invasion of the mastoid. Delirium tremens. Removal of bullet. Radical operation, with skin graft. Recovery with a slight amount of hearing.

Michael B., thirty-three; married. Admitted October 20, 1903, to Aural Department. Patient well developed, large, strong and well nourished. Police officer. Was said to have been shot accidentally at station; while removing his trousers, his revolver fell from his pocket and was discharged. Taken to Relief Station. The region of the right ear was found much discolored by powder, with an ugly ragged wound leading directly inwards. An exploratory operation was made to remove the bullet, but it was not found. This was thirty-one days before admission to the Aural Department. Soon after he was removed to the main hospital, and later an unsuccessful explor-

atory operation was made to discover the bullet. The patient then went into alcoholic delirium, which lasted two or three weeks. The discharge from the right ear became purulent and very copious; treated by antiseptic irrigations and dressings.

Examination: Mentally unbalanced, affable, rather loquacious. Region of right ear swollen; auricle swollen and red, evidently dermatitis; considerable swelling and redness, with some edema over mastoid. Partial stenosis of external canal because of swelling of the skin. Pus very copious, and with a clear, serous fluid welling up from the canal; wounds of previous explorations firmly and neatly healed.

Examination by probe shows something rough in the external canal, which, on being removed with the forceps, is found to be a small piece of lead. The clear fluid was examined, but found not to be cerebro-spinal, but to contain a high per cent of albumin. Treated by hot irrigations and compresses to the ear. A few days later, probe found something rough in the canal, movable; and a much larger piece of lead removed with the forceps, the swelling of the canal being somewhat diminished.

October 27. Probe still finds something foreign in the depth of the canal. An incision was made from above and anterior to the insertion of the auricle, running backwards and down to the tip of the mastoid. The periosteum was elevated, extending into the canal till the middle ear was exposed; and there projecting from the bone was a small piece of oxidized lead; forceps showed it to be firmly imbedded. It was sticking out of the hard bone below the round window, above the jugular bulb, forward of the posterior canal wall enclosing the facial nerve, and just backward of the opening of the Eustachian tube. At its entrance it had evidently cracked the bone between the external canal and glenoid fossa, because soon afterwards movement of the jaw was painful, and there was swelling in this region. With fine chisels the very hard bone around this piece of lead was slowly dissected away, some of the posterior canal wall of necessity removed. On account of its close proximity to these vital points it was necessary to be exceedingly careful, and therefore the operation was prolonged; but it was very fortunate that the jugular bulb probably had an abnormally low position, and the carotid canal probably was deep and farther forward than usual. However, after two and one-half hours, a piece of bullet which had mushroomed and

was five or six times larger at its inner end than at its presenting part, was extricated. Very slight amount of hemorrhage during the whole of the time of operation. The parts were curetted smooth and the cavity was packed. Up to this time there had been more or less delirium.

November 9. The middle ear has continued to discharge very copiously; canal narrowed; stretched open by tents of cotton wet with boracic acid and alcohol. No more delirium; patient quite rational.

November 25. Following hearing tests made by house officer; Weber, lat. to right. Watch, A. D. o. A. S. $\frac{50}{50}$

a.	0	5	0	0	0	19	10	7	15	10		
Schwabach A. D.	b.	8	5	7	5	0	A.S.	7	5	5	5	5
		C	C ⁱ	C ⁱⁱ	C ⁱⁱⁱ	C ^{iv}		C	C ⁱ	C ⁱⁱ	C ⁱⁱⁱ	C ^{iv}

Was allowed to leave the hospital for a couple of weeks for recuperation, etc., and was treated at the Out-Patient Department. The discharge from the canal and from the persistent mastoid sinus was copious. Re-admitted to hospital January 8, 1904.

January 9. Operation, middle ear, etc., full of granulations; old incision reopened and complete exenteration made, removal of attic contents and throwing all the cavities into one. The hole made by the bullet has filled with granulations; scraped out.

January 17. Thiersch grafts by skin from the leg, covering the whole of the inner cavity. Proper flaps made and posterior wound sutured.

March 7. Two stitches sloughed; discharge profuse from ear, cleansed and treated by the dry method.

March 10. Under cocaine, a couple of stitches put in. On 11th discharged from the hospital.

After this patient was treated occasionally at the Out-Patient Department. November 30 has the following notes:

The wound posteriorly healed. The inner surface of the cavity completely dermatized except for one small perforation which leads directly inward into the inner wall of the middle ear, evidently the cavity left by the bullet. This has been treated by curetting, caustics, astringents, etc., but probably persists because of slight caries of the walls. It, however, gives him no annoyance and can be kept comfortable by occasional treatment. The hearing is almost abolished. Cannot hear the voice in the right ear. At long intervals a little

buzzing or low whistle tinnitus in that ear; not annoying. Patient somewhat addicted to alcoholic stimulants, is a large eater, and well nourished as stated. Before July had a sudden dizzy fit; fell off a chair while at a game; he fell towards the right side, was unconscious so that did not know what happened. Vomited a great deal afterwards, "probably because of something the physician gave him." He got all over it and has not had a dizzy spell since. The attack was probably not of aural origin.

At this visit hearing tests were as follows: A. D. Rinné negative. Sound of very loud voice faintly heard.

	a	0	8	6	5	
Schwabach, A. D.	b	8	6	7	10	Galton's whistle high.
limit 2.7		C	C ⁱ	C ⁱⁱⁱ	C ^{iv}	

Patient went on in this condition with occasional treatments till about the middle of March, 1905, when late one night his body was found at a patrol box, he probably having succeeded at this time in his attempt at suicide. This was denied by him after the first attempt, but the powder stains and the position of the wound show that the pistol must have exploded nearer than was alleged.

This case is reported as showing the extremely delicate position into which the bullet was driven, almost the only one in that region it could have reached without fatal consequences.

The writer wishes to express gratitude to Drs. H. J. Inglis and W. F. O'Reilly for valuable assistance; and especially to Dr. C. R. C. Borden, who compiled the South Department statistics and performed some of the operations in the contagious wards.

XXXIX.

OBSTRUCTION OF THE EUSTACHIAN TUBE A FACTOR IN POST-OPERATIVE MASTOID FISTULA AND IN CHRONIC SUPPURATION OF THE MIDDLE EAR.*

BY THOMAS HUBBARD, M. D.,

TOLEDO.

My attention was called to the question of tympanic drainage in the course of observation on certain patients having permanent perforations of membrana tympani. The intermittent discharge was at first of catarrhal character and later muco-purulent or purulent. The cause of recurrence was either irritation or infection from the auditory canal with increase of fluid in the tympanum, or congestion of the Eustachian tube with consequent obstruction to normal tympanic drainage. With this conception of the important function of the tube in mind one cannot escape the conclusion that it should be carefully studied as a factor in all conditions of the middle ear and cells accessory thereto, in which drainage is diverted externally. In the cases above referred to, having perforate drum membrane with tubal obstruction, all that was necessary was to relieve Eustachian congestion, cleanse the external canal, protect the tympanum from irritation and normal drainage was re-established. In other words, it is the relation of the calibre and functional activity of the tube to the quantity and quality of fluid to be drained away which determines the direction of flow. To illustrate this point one of the cases will be briefly narrated:

A gentleman having a permanent perforation of more than ten years' duration sought relief from offensive discharge and constant pruritus and erythema of the skin of the canal. The routine treatment was used for several weeks, antiseptic cleansing of the canal, removal of small granulations, tympanic irrigation through a large perforation, catheterization and medication of an obstructed tube by bougies dipped in 10 to 15 per cent. nitrate of silver ointment. This was followed by

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the adaptation of an artificial drum membrane—a rubber disc on silver wire—and discharge promptly ceased, having been diverted through the Eustachian tube. A year after the initial use of the rubber disc as an obturator he reported that his ear was in satisfactory condition, hearing improved, and there was no perceptible discharge even during an attack of coryza. This case is narrated not to enlarge the subject matter under discussion, but to illustrate the principle of treatment of aural fistulous discharges in general, including a certain class of fistulæ persisting after the operation for simple acute mastoiditis.

To be sure, the majority of fistulæ at the site of mastoid operation are due to incomplete operation; either a pyogenic cell having been overlooked, or antrum not thoroughly cleaned out, or diseased attic being the source of pus. Such as these usually require a second operation. But there are cases in which a perfect operation is followed by a persistent mucus or muco-purulent discharge from a small fistulous tract in the depth of the excavation, and to this condition attention is directed. *The first step is a careful examination of the Eustachian tube.* An acute purulent mastoid inflammation of a few weeks' duration with constant flow of pus through the tube causes hypertrophy of normal lymphoid tissue in and around the tube and finally obstruction to drainage. Simple inflation by the Politzer method or even the catheter does not definitely determine the functional capacity of the tube. The use of the bougie is indicated for accurate diagnosis and treatment. The normal mucous secretion of tympanum and accessory cells left with intact secreting membrane will seek outlet by the channel of least resistance. The problem is to re-establish the normal function of the tube; to encourage active drainage—something more than merely an overflow of the tympanic contents.

In one case which I have in mind, in which a slight mucus flow from the wound persisted several months, a few applications of the bougie dipped in nitrate of silver ointment seemed to remove an obstruction and the fistula promptly healed. In this case there was probably granulation near the Eustachian orifice. Recovery would probably have taken place in time, but even a mucous fistula is more or less of an opprobrium in mastoid surgery, and rational treatment is urgent. The habit of diverted drainage should not be allowed, if pos-

sible to prevent, for it is not improbable that even Eustachian secretions, following the path of least resistance, may be permanently directed toward the fistulous tract, if tubal obstruction near the pharyngeal orifice prevent for any considerable time natural flow into the naso-pharynx.

The second division of the subject refers to *tubal obstruction as an indication for radical surgical operation in chronic suppurative conditions*. Whatever be the cause of the purulent discharge—more or less extensive areas of pyogenic membrane in poorly drained cells, or eroded membrane, ultimate success of treatment may depend upon the condition of the natural drainage canal, the Eustachian tube. The proposition is simply stated. If the tube be permanently closed, impervious to forcible inflation and impenetrable by prolonged application of the bougie, then the only way by which the external discharge can be stopped is by destruction of all secreting membrane, normal or pyogenic, and cicatrization and epidermization of the tympanum attic and mastoid cells.

I can state my position more clearly by an illustrative case. A lad of seventeen gave the history of having had a foul smelling ear discharge for twelve years. The symptoms for which he applied for relief were: constant discharge with odor, headache, occasional vertigo, lack of power of mental concentration interfering with his education, and impaired general health. Routine treatment, attic and tympanic irrigation, gave decided relief for a time. Persistent attempts to open the Eustachian tube failed. There was probably recent obliteration of the osseous portion, as he told me that for about four months he had not been able to blow air through by the Valsalva method, a practice which had formerly given him relief. Treatment was stopped for a month to see if improvement was permanent, and at the end of that period he requested the radical operation, as he had relapsed into the former condition. The radical operation was done and the result was perfect. All annoying symptoms disappeared and his general and mental condition are decidedly improved. In this case permanent occlusion of the tube was a factor in deciding against prolonged treatment and fortified the decision in favor of the radical operation. It was also a factor in the excellent result.

Conclusions: Obstruction of the Eustachian tube is a common sequence of acute purulent otitis media and purulent mastoiditis, and retards recovery.

It is a factor in causing chronic otorrhea, and post-operative mastoid fistulæ or delayed healing of mastoid.

Permanent occlusion gives one indication for the radical operation in chronic purulent otitis.

The condition of the tube should be determined prior to radical operation, and if permanently occluded in the osseous portion there is no necessity for deep curettment of the tympanic orifice.

DISCUSSION.

Dr. Edward B. Dench, of New York, said the occurrence of a post-aural fistula after mastoid operation as the result of permanent occlusion of the Eustachian tube was a possibility, but he thought it was rare. Personally, he had never seen it. In a certain number of cases these post-operative fistulæ persisted for some time, and the explanation offered by Dr. Hubbard for the chronic discharge might be the correct one. Almost invariably, however, the persistent suppurative process could be traced to the presence of a small piece of necrosed bone that had been left behind.

The speaker emphasized the absolute uselessness of depending on drainage through the Eustachian tube, and in any case where the otologist had to deal with a foul, persistent discharge resulting from the presence of dead bone, there was only one thing to do, and that was to remove the cause of the suppuration by surgical intervention.

Dr. Max A. Goldstein, of St. Louis, said that at the last Section Meeting he showed two cases where there was a distinct connection between the mastoid fistula and the Eustachian tube, so that by catheterization of the tube, and blowing air or vapor through the catheter, mucus from the Eustachian tube could be ejected through the mastoid fistula. In both of these instances the Eustachian tubes were perfectly free, and their contents were mucus in character—not mucopurulent.

XL.

CARCINOMA OF THE LARYNX.*

By S. E. SOLLY, M. D.,

COLORADO SPRINGS.

I present to you a report of a case of carcinoma of the larynx in which complete laryngectomy was performed. The patient died two months later. The direct cause of death was obscure, and is especially worthy of consideration.

L. F., aged 43 years, woman, married, white, native of Australia; occupation, laundress; residence, Nome, Alaska.

First Examination, September 10, 1904. History: Had always been healthy and unusually strong, active and temperate in her habits; no previous serious illness. Two years before began to get hoarse, till voice entirely disappeared. Three months ago dyspnea was first experienced, and it gradually increased. In consequence she gave up work and went to Tacoma, where she consulted Dr. Peleg Wing, who immediately sent her to me at Colorado Springs.

Present Condition: Marked dyspnea; general appearance healthy, well nourished; height 5 feet, 6 inches, weight 152 pounds. Before dyspnea began, weight had increased from her average normal weight of 145 pounds to 160 pounds.

Larynx: After spraying with adrenalin and cocain a good laryngoscopic image was obtained, showing a nodular tumor growing from the anterior wall of the larynx, and extending around two-thirds of its circumference. The upper surface of the growth was pushing up the false cords, so that they were tense and convex, but it did not extend above them. I removed a portion of the growth with a curette; it proved to be carcinoma. A curetting at the same time from the posterior wall showed normal membrane.

Sept. 5: The dyspnea became so serious that tracheotomy was done in an emergency by my colleague, Dr. Gildea.

Sept. 10: As Dr. W. W. Keen, of Philadelphia, happened fortunately to be in Colorado, I waited for him to perform a total laryngectomy. I had previously seen him do this operation. He very kindly operated the next day. His report is as follows:

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

Operation, Sept. 11, 1904: I rigged up extemporaneously a Trendelenberg apparatus for the administration of the chloroform by carrying a long rubber tube into the tracheotomy tube, and, in order to prevent kinking of it at the opening of the tracheotomy tube, I wound a spiral spring for about four inches around that end, but I soon had to discard it and administer the chloroform on some cotton and gauze held by a pair of forceps over the tracheotomy wound.

In order to get room enough, I first made an incision in the middle line from the tracheotomy opening to the top of the sternum. The trachea lay at a great depth. I next divided three rings below the tracheotomy tube. This enabled me to displace the tube downward sufficiently to work above it, though, as I have already said, I soon had to dispense with the tube entirely. When I took the tube out, I passed a silk suture through the skin and the margins of the tracheal wound and drew apart the two margins of the wound, passing the sutures through the skin of the two shoulders, so that I was able to dispense with retractors. She was then placed in the Trendelenberg position. I then proceeded to do a total laryngectomy in the manner devised by myself (*Annals of Surgery*, July, 1899). As the epiglottis was entirely free from disease, I left it in place. Only two vessels were tied. A light packing of iodoform gauze was placed in the upper part of the wound where it was shut off by suture from the pharyngeal cavity; this was to be removed the next day.

The day after the operation, her temperature by the vagina was 101.8 degrees, its highest point. By the fourth day it had fallen to the normal, and after that fluctuated between the normal and 101 degrees. Nutritive enemata were given for six days afterward. She was annoyed by a considerable amount of discharge from the wound, which, of course, was infected in consequence of the already existing suppuration. Food was taken by the mouth on Sept. 15, the fifth day. She sat up in bed on the second day and was out of bed on the fourth day. Wound healed entirely by October 25.

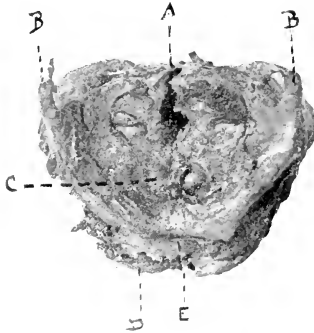
The specimen removed by operation consisted of the larynx, the first ring of the trachea—the epiglottis was not removed—portions of the right thyroid lobe and of the isthmus, with these a parathyroid gland and a normal lymph gland; also portions of both sterno-thyroid muscles. Microscopical examination of the growth showed carcinoma of the squamous type.

Section of the right margin of the isthmus of the thyroid revealed carcinomatous invasion; none in the lobes or muscles.

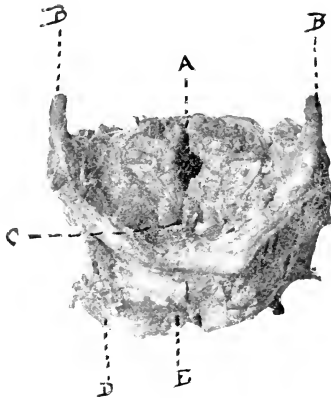
Convalescence: There was never any evidence of communication between the mouth and wound. Improvements in all particulars appeared to continue for several weeks. Three weeks after the operation, it was noticed that she was beginning to whisper intelligently.

Relapse: About the middle of October there was some enlargement observed over the site of the right lobe of the thyroid. Dr. Keen telegraphed, urging removal of the portions of the thyroid gland not excised at the operation. The patient would not consent to a second operation, and therefore an X-ray treatment was given, three times a week. The treatment did not arrest the slow increase of the swelling, and dyspnea began to appear, though in a mild degree and slightly to increase. Upon November 6, two months after the operation, she received her last X-ray treatment, which she did somewhat reluctantly, as she thought it had lately caused her to breathe with more difficulty. She then walked up a flight of stairs to her room, but quickly began to walk up and down the room in an excited manner, exclaiming she could not get her breath. The house physician came almost immediately and found her sitting erect with very little movement of the chest and cyanosis coming on. The doctor could not then introduce the tube which the patient usually wore, but passed down a probe without encountering any obstruction. A little clotted blood in a watery secretion was ejected, and then her head fell forward and respiration ceased; the heart continued to beat for perhaps one or two minutes.

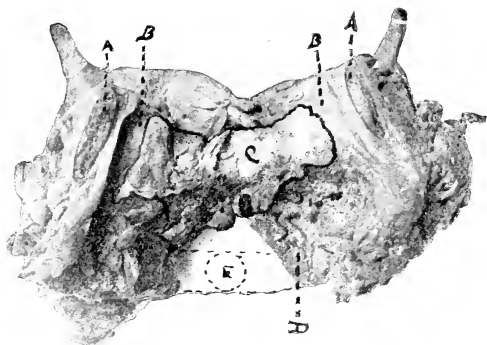
Post-Mortem, sixteen hours after death: A well developed and nourished woman at middle age. Tracheotomy opening in the neck. Incision above and below the tracheal opening healed, with the exception of a small granulating area immediately below in front. Tracheal opening smooth and admitting the tip of the little finger without difficulty. On the right side of the tracheal opening a hard mass was felt about the size of a pigeon's egg, and on the left a similar mass of smaller size. Connecting the two a bridge of infiltrated tissue could be felt passing immediately below the tracheal opening. Two glands about the size of almonds could be felt on the left side along the posterior border of the sterno-mastoid; the upper end of the trachea, esophagus, thyroid and adjacent



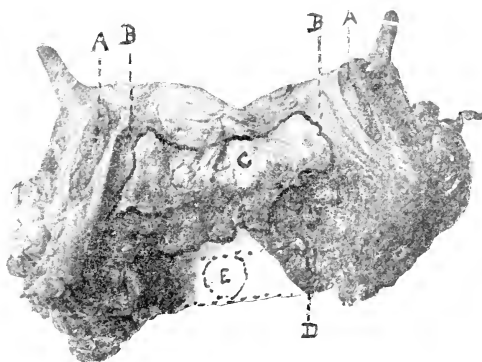
A—Uninvaded lumen of larynx.
 B—Cornu of thyroid cartilage.
 C—Carcinoma.
 D—Thyroid (right tube).
 E—Site of emergency tracheotomy.



A—Uninvaded lumen of larynx.
 B—Cornu and thyroid cartilage.
 C—Carcinoma.
 D—Right tube of thyroid.
 E—Site of emergency tracheotomy.



- A—Cricoid cartilage.
- B—Uninvaded lumen of larynx.
- C—Carcinoma.
- D—Right lobe thyroid.
- E—Site of emergency tracheotomy.



- A—Cricoid cartilage.
- B—Uninvaded lumen of larynx.
- C—Carcinoma.
- D—Right lobe of thyroid.
- E—Site of emergency tracheotomy.

muscle were removed en masse. The trachea showed no appreciable changes or stenosis, esophagus negative. The lateral masses noted appeared to be intimately connected with the lobes of the thyroid. Heart and vessels normal except a few small atheromatous patches in the arch of the aorta. Pleuræ normal; lungs crepitant throughout; cut surfaces showed everywhere a large amount of dark frothy fluid. Fibrous adhesions between omentum and cecum, peritoneum smooth; no fluid. Left kidney small, less than 2-3 the size of the right one. Capsules stripped with difficulty; other viscera no gross changes.

Microscopical Examination: Kidneys and liver showed passive congestion and many small hemorrhages. Sections were made from the tissue on either side and below the trachea, including the upper end of the trachea for a distance of two or three rings. Section from left side including the left lobe of the thyroid showed nothing beyond dense round celled infiltration. Lower section showed small carcinomatous area on anterior mucous surface of trachea. Tissue external to trachea showed granulation tissue and muscle infiltrated with carcinoma. Right section showed no changes in trachea except desquamation of epithelium and round celled infiltration. Right lobe of the thyroid infiltrated with carcinoma of squamous type.

This is a summary of the facts.

There was a brilliant and successful operation, and except for the natural hesitancy of the operator to remove the entire thyroid body, which macroscopically appeared normal, there would probably have been no recurrence of the disease. The original tumor evidently began, as they so frequently do, in the thyroid angle, and remained confined almost entirely to the area covering the inner surfaces of the thyroid cartilages, but unfortunately it must have infected, through the cartilage, the thyroid gland. That the disease began intrinsic to the larynx accounts for its slow growth in two years, since it is usually rapid when its primary seat is extrinsic.

What was the cause of death? Suffocation? No, there was no chronic stenosis or even sufficient temporary swelling of the tracheal mucous membranes.

Acute edema of the lungs? No, there was not time for that, moreover the character of the respiration and the post-mortem appearances did not bear out this opinion; although

the frothy liquid which exuded on section of the lungs 16 hours after death may suggest it, it was too slight in amount.

The cutting of the pneumogastric nerve in the operation could not account for it, for the symptoms did not come on for two months. Excision of the pneumogastric, Dr. Keen tells me, is only followed by temporary disturbances of respiration.

Could death have been caused by suspension of the functions of the parathyroid glands?

As I find physicians generally are not well informed about the anatomy and physiology of these bodies, I venture to briefly speak concerning them. There are four parathyroid glands in man. They are found adjacent to the thyroid gland, two on each side of the neck. While variable in size and position, are of an average measurement of 6-7 m.m. in length, 3-4 m.m. in breadth, and 1.5 to 2 m.m. in thickness, and are oval in shape. They are apt to be mistaken for the accessory nodules of thyroid tissue which are variable in size, number and position. The parathyroids, while they may be mixed in with these, or even be enclosed within the capsule of the thyroid, are different in their structure, in which they resemble the pituitary gland, and are moreover quite distinct in function.

Experiments upon animals have demonstrated that if the thyroid alone is removed, a cachexia results, which leads on to myxedema. On the other hand, if the parathyroids only are excised there ensue entirely different symptoms of which polypnea, that is rapid breathing, and tetany are the most evident. When they are both removed, the parathyroid symptoms are less, but there appears a clinical picture resembling a complete case of exophthalmic goitre.

When parathyroidectomy is alone performed the symptoms are less, according to the number of glands removed, also if the animal is previously and even subsequently fed upon a vegetable or milk diet.

In connection with this influence of diet, it is well to note that the symptoms are very slight in Aves and Rodentia, are increased but still slow in the Ungulata. In the Anthropoidea there is well-marked chronic cachexia; and in the Carnivora the symptoms take an intensely acute and rapidly fatal course.

Chiefly for these reasons, the theory has been advanced that the parathyroid secretion is essential to an animal's well-being

and that it antagonizes some toxin formed during the metabolism of nitrogenous food.

Might not it be a possible and even probable explanation of the cause of death of this patient, that first the removal of one parathyroid in the operation, and then the gradual destruction by the carcinoma of the remaining three, brought it about mainly in consequence of the effects of their obliteration upon the respiration.

With respect to the possible part played by the X-ray treatments, I would suggest that as one of the immediate effects of the exposure of the X-rays is to cause a local hyperemia, therefore an increased pressure was induced and so an added difficulty in the proper functioning of these glands. This might account for the patient feeling worse after the treatments, or again as it has been demonstrated that X-rays cause the deterioration of glandular tissue, they may have accelerated the destruction of the parathyroids.

DISCUSSION.

Dr. Chevalier Jackson said the case reported by Dr. Solly was an exceedingly interesting one, and had been skillfully managed. Professor Keen's technique for total laryngectomy was well known, and could not be much improved, excepting in regard to the Trendelenburg anesthetizing tube, which he would probably eventually abandon. All the chloroform that was required could be very easily given on a gauze sponge held in a haemostatic forceps.

Dr. Keen had abandoned preliminary tracheotomy, and Dr. Jackson said he thought it was entirely unnecessary to keep these patients breathing through a tracheotomy canula for a week prior to the operation. The tracheotomy, if one was necessary, could be done at the time of the operation, the only argument against this being the advantage of a preliminary union of the trachea to the neck integument.

It was a good idea to have these patients sit up as early as possible after the operation, as many of the resulting pulmonary complications were the result of keeping them in bed too long, especially if supine. Morphin and deep anesthesia were the other two causes of pneumonia.

The speaker said there was one feature of the treatment described in Dr. Solly's paper that he wished to criticise, and that was the giving of nutrient enemata. He regarded them

as a delusion and a snare, although it was sometimes necessary to give them to satisfy the family. He did not think they were of any value as a means of prolonging life. While the rectum was a good thing to drink out of, it was a poor thing to eat out of. Thirst could be quenched, but hunger could not be appeased. A stomach-tube was harmless, and enabled the placing of food where it could do some good. The odor of rejected alleged nutrient enemata made one hope that none had been absorbed.

Dr. Jackson said that in one of his cases of total laryngectomy he removed the involved pneumogastric nerve and the common carotid and jugular, and the patient apparently suffered no ill effects from it. About four months later the malignant process for which the operation had been done recurred in a gland on the opposite side of the neck; this increased in size until it pressed upon the pneumogastric nerve on that side, with resulting cadaveric paralysis, so that the patient could not expectorate, and he literally drowned in his own secretions. With each respiratory movement, the secretions bubbled up into the larynx, and then receded into the bronchi, until cyanosis and death occurred.

While he regarded Dr. Solly's ingenious parathyroid theory plausible, and probably correct, he would ask if any nerve involvement had been noted.

Dr. H. W. Loeb, of St. Louis, said that of five cases of laryngectomy that had been under his observation, the first three died of a recurrence of the disease. In one of these there was a partial laryngectomy followed by a total laryngectomy, and finally death. In the other two, recurrence and death took place within six months after the complete operation. The fourth case was that of a stone-mason who had been treated by another physician for supposed syphilis of the larynx. The case proved to be one of carcinoma, as demonstrated by the microscope, and the entire larynx was removed. The man made an uneventful recovery, and was still enjoying good health, working at his trade, fifteen months after the operation, without any signs of a recurrence.

In the fifth and last case the larynx was removed without a preliminary tracheotomy. For a week after the operation the patient was fed by means of the stomach-tube. On the seventh day, while sitting up in bed, he had a sudden gush of blood from the mouth, and died. At the post-mor-

tem the operative wound was found to be in excellent condition, and death proved to be due to a pulmonary embolism.

Dr. John F. Woodward, of Norfolk, Va., said that in 1899 he was consulted by a man 40 years old who complained of hoarseness. There was neither swelling nor tumor, nor other apparent cause for the hoarseness. About three months later, however, a swelling was noticed between the true and false cords on the left side. He was treated for a time, and his symptoms improved, but subsequently he complained of dyspnea, and there was a swelling over the entire inner portion of the left larynx. A swelling of the thyroid was also noticed at that time. He was lost sight of again, and when he reappeared, about six months later, he said that he had visited the Johns Hopkins Hospital, where he had been told that he had carcinoma of the larynx and thyroid. At first he refused operation, but finally returned and begged to have something done for him. With the assistance of Dr. Joseph White, of Richmond, Va., a tracheotomy was done under cocain with considerable difficulty, on account of the thickened tissues. The patient returned to his work as a railroad man, and remained comparatively well for about eighteen months. The pneumogastric nerve then showed evidence of involvement by pressure, and the patient died by being drowned in his own secretions, as in the case reported by Dr. Jackson. Dr. Woodward doubted the value of late operations in these cases, inasmuch as tracheotomy seemed to promise as much comfort and prolongation of life.

Dr. Wendell C. Phillips, of New York, said that in connection with the discussion of Dr. Solly's paper, the fact should not be lost sight of that those men who operated with comparative frequency for the removal of the larynx, either partial or complete, advocated a preliminary tracheotomy, and they did so for the reason that their final results were better, so far as the occurrence of septic pneumonia was concerned.

Dr. E. Fletcher Ingals, of Chicago, said we should not lose sight of the rule that laryngectomy should not be done in extrinsic cases; that is, when the disease had extended outward beyond the walls of the larynx, but in intrinsic cases the results were often very favorable. The speaker said he had in mind two such cases where the operation was done for him between two and three years ago. In both instances the laryngectomy was done by the Keen method; in one of them a

preliminary tracheotomy was done, and in the other it was not. Whether such a preliminary tracheotomy tended to prevent the onset of a septic pneumonia was doubtful. An interesting feature in connection with his cases was that both patients were able to enunciate very distinctly after the operation, although the trachea was stitched to the skin, and one of them had learned to talk so that he could be heard distinctly fifteen or twenty feet.

Dr. Solly, in closing, said that in the case he had reported, the condition was an intrinsic one, and very clearly defined.

In the case reported by Dr. Jackson, the patient's death was apparently due to pressure on the opposite pneumogastric, and this might have occurred in his own case, although no nerve elements were found in the tissues removed at the autopsy, and there were no evidences, during life, that the opposite pneumogastric was involved in the recurrent growth. The patient raised a little frothy secretion just prior to his death, and on section of the lungs, some frothy matter was found there. The post-mortem was very carefully made, and no thrombus nor embolus was discovered; neither were there any evidences of renal disease, although one of the kidneys was small.

AN UNUSUAL CASE OF LARYNGEAL SYPHILIS RE-QUIRING TRACHEOTOMY.*

BY CLEMENT F. THEISEN, M. D.,

ALBANY.

The following case, because of several rather unusual features, was considered worth putting on record:

Mrs. J., aged 38 years, married, consulted the writer for the relief of a gradually increasing difficulty in breathing. This she had noticed for nearly a year, and on any exertion, like walking up stairs, great dyspnea always came on.

There was, at the time the patient consulted the writer, a well marked respiratory stridor, and the inspiratory thrill, which is characteristic of laryngeal stenosis, could be felt when the fingers were placed over the region of the larynx. Her first husband contracted syphilis, and also developed a pulmonary tuberculosis, of which he died. The patient's family history, however, is negative in this respect, there having been no cases of tuberculosis so far as known.

The patient herself was inoculated with syphilis by her first husband some years ago, and received a thorough course of treatment. At that time there were well marked constitutional symptoms, with necrosis of the bone in several of her toes, necessitating some operative work. No symptoms of laryngeal obstruction developed until about a year before the writer was consulted, and since then, as before stated, there had been an increasing difficulty in breathing.

On examination, the nose and naso-pharynx, with the exception of a slight naso-pharyngeal catarrh, were found practically normal. Patient had a slight chronic pharyngitis. The tonsils were not enlarged. The uvula was slightly elongated and thickened, and was infiltrated for about one-half its length from the tip. This portion of the uvula was very hard to the touch. There was no ulceration, nor any evidence of former ulceration.

The entire epiglottis was infiltrated, its surface being perfectly smooth, however, and was also extremely firm to the touch.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

It was pulled back to such an extent that the laryngeal entrance was practically closed, and the only way a laryngeal examination could be made was by pulling up the epiglottis after cocainization. The epiglottis was also free from ulceration. This peculiar position of the epiglottis is probably due to old lateral syphilitic adhesions. There is considerable resistance when the epiglottis is pulled up in making a laryngeal examination. The aryepiglottic ligaments appear thickened and shortened.

On laryngeal examination, a most interesting state of affairs was found. The glottis, with the exception of a very small opening posteriorly, was closed by a mass of cicatricial tissue stretching from side to side, just under the vocal cords. This was found to be extremely dense and unyielding when examined with a probe. Practically no changes in any other part of the larynx could be seen. The movements of the arytenoids were somewhat impaired, the result probably of an old perichondritis.

A careful physical examination of the patient was made by an excellent general practitioner, who found her lungs normal. He found a right movable kidney and a digestive disorder, otherwise the patient was found to be in a fair general condition.

The sputum was examined several times with negative results. The patient was told that her laryngeal condition was serious, and consented to remain in the hospital for a time. A piece of infiltrated epiglottis was removed and sent to the Bender Laboratory for examination. The report stated that the piece removed showed simply a chronic inflammatory process. No tubercle bacilli were found in sections of the removed tissue.

Iodide of potash was administered, in order to see what effect it would have on the infiltrated uvula and epiglottis. The uvula became decidedly thinner and softer, but no change in the epiglottis could be determined.

The administration of the iodide, however, brought on a sudden attack of laryngeal edema, with greatly increased dyspnea, and it was then promptly stopped. Preparations for performing tracheotomy were made, but the edema subsided so quickly, with proper local measures, that it was not required.

As the patient did not desire any further operations at this time, she was discharged from the hospital, but was kept

under constant observation. During the succeeding few months she got along fairly comfortably, when she did not exert herself in any way, but finally, when attacks of dyspnea became more frequent, she consented to a tracheotomy.

She was again admitted to the hospital and a low tracheotomy performed. A general anesthetic was not used on account of the great laryngeal obstruction, but the operation was performed with a solution consisting of equal parts of a 1-2 per cent cocain and a 1-10,000 adrenalin chlorid solution, making a solution of 1-4 per cent cocain, and 1-20,000 adrenalin.

In a discussion upon the fatal results of operations upon the nose and throat (in the Transactions of the American Laryngological Association for 1903), I called attention to the value of this solution in performing tracheotomies. It should be put up under aseptic precautions, preferably the day of the operation, and the bottle kept under a 1-1,000 solution of bichlorid, until the solution is drawn into a sterile hypodermic syringe after the patient's neck is prepared for the incision. It is only necessary to inject a few minims at different points along the line of incision. It is an ideal solution for tracheotomies in adults. I mean of course in cases in which the patient is in no immediate danger of death, so that the operator can take his time.

The use of a general anesthetic in cases where there is some form of laryngeal obstruction,—and that is usually the condition for which a tracheotomy is performed,—is not safe.

In emergency cases, where the patient is in imminent danger of death, the operator would of course not lose time in using any anesthetic at all, either general or local, nor could a local anesthetic of this kind be used, in performing tracheotomies upon children or very nervous adults. It should only be used in selected cases. The addition of even such a weak solution of adrenalin chlorid to the cocain solution, has distinct advantages, as it assists in preventing the possible unfavorable effects of the hypodermic injection of cocain.

The writer's patient complained of very little pain during the operation, and it certainly adds very materially to the comfort of the operator, if he is able to take his time in performing a tracheotomy.

The further history of this case is of no great interest perhaps, except that the gain in the patient's general condition has been quite remarkable.

At the time of the operation she was much reduced, and since then she has gained over thirty pounds in weight. She is still wearing the tracheotomy tube, and will probably continue to do so for some time. She has been told that a radical operation, consisting of a thyrotomy, with a careful removal of the cicatricial tissue, followed by intubation, might relieve the breathing to such an extent that she would be able to permanently discard the tube. Up to the present time, however, I have not been able to get her consent, as she is so well satisfied with her condition. There is no way of dilating this stricture from above, as the cicatricial tissue is so absolutely unyielding.

The question as to just what to do in such severe cases is an interesting one. We must always be prepared to perform tracheotomy, and must bear in mind a statement of Simpson's, "That all cases of laryngeal or tracheal stenosis, however gradual, may at any moment take on a sudden exacerbation." The proper method of getting rid of the laryngeal stenosis after tracheotomy is of great importance.

J. Payson Clark has reported an interesting case of probable syphilitic stenosis of the larynx, in a young adult, on whom a tracheotomy had been performed for increasing dyspnea. Dr. Clark was unable to pass intubation tubes, so while the patient was under ether, the tracheotomy tube was removed, and gradually larger sizes of female urethral sounds were passed through the tracheal opening and up into the larynx. A pair of long, narrow, slightly curved forceps was then passed up through the tracheal opening and through the glottis. The intubation tube was put on the forceps, which was then pulled back through the tracheal opening until the intubation tube was properly adjusted. The patient, however, unfortunately coughed out the tube, and as he would not consent to have it reinserted the tracheotomy tube had to be put back, when he left the hospital. This method would probably not be applicable to cases of syphilitic stenosis, in which, as in the writer's case, the cicatricial tissue practically occludes the glottis, and is so dense. The patency of the glottis would first have to be restored by removing this tissue by a laryngo-fissure, after which this method would undoubtedly be very useful.

In cases of simple syphilitic stenosis of the larynx, caused by infiltration and thickening of the cords and ventricular bands, or perichondritis with edema of the mucous membrane,

intubation with gradually larger tubes, preceded in all severe cases by a tracheotomy, is, I believe, the best treatment.

The writer has had several cases of this sort, in one of which the stenosis was in the trachea, well below the glottis, and could be finally dilated with Schrötter's tubes.

A preliminary tracheotomy in severe cases of syphilitic stenosis of the larynx should be performed perhaps in the majority of the cases. Then the operator can work from above, without the danger of an attack of sudden edema, and asphyxiation of the patient.

There are many cases of syphilitic stenosis of the larynx on record, in which tracheotomies had to be performed for increasing or sudden alarming dyspnea. I will not take your time in considering them in detail.

Such cases have been reported by Jeanne⁶, Leonard⁷, Navratil⁹, Descos¹⁶, Stein¹⁰, Hall¹⁹, Clark², Woods¹⁸, Spencer⁸ and in the cases reported by these authors, the stenosis was caused by infiltration and thickening of the vocal cords, and ventricular bands, and not by cicatricial tissue stretching between the cords.

In a fairly careful search of the literature of the past ten years, not many cases were found in which the stenosis was produced by cicatricial tissue occluding the glottis by uniting the cords or extending across the trachea.

Cases of this kind have been reported by Bleyer¹⁷, Moritz²¹, Collinet¹³, Echtermeyer¹⁴, Heymann⁵ and Hubbard¹². In Hubbard's case the diagnosis of syphilis was not absolutely positive. I was only able to find a few reports of cases in which the peculiar position of the epiglottis, closing the laryngeal entrance, was present.

Navratil¹⁵ and Zwilling¹¹ have reported such cases.

Bleyer¹⁷ has reported eight cases of syphilitic stenosis of the larynx caused by a web formation. They were operated on by his combined method of tubage and the knife. He first cut through the membranous formation with Lenox Browne's sharp dilator, and then quickly dilated with intubation tubes.

In Hall's case of syphilitic stenosis, a tracheotomy had to be performed, and the patient died after coughing out the tube.

In Moritz' case there were adhesions uniting the cords, in a young woman, aged 24 years. A tracheotomy was performed.

Collinet has reported a case of syphilitic stenosis of the larynx, in which cicatricial tissue took the place of the cords and ventricular bands.

In Echtermeyer's case there was a membrane uniting the cords and almost closing the glottis. A tracheotomy was performed, after which the membrane was removed, and intubation practiced until the patency of the larynx was restored.

In a case reported by Spencer, the stenosis was caused by the presence of firm irregular masses of tissue, which covered the vocal cords and ventricular bands. This was removed by thyrotomy.

In Descos' case a tracheotomy was performed for extreme dyspnea, and later a laryngo-fissure was made, and the soft parts of the larynx resected. There were no adhesions in this case.

Navratil¹⁵ has reported two cases, in which tracheotomy had to be performed for laryngeal stenosis caused by syphilis.

Heymann⁵ has reported a number of cases in which membranous adhesions existed in the larynx. He does not give the exact number of cases.

In a case recorded by Sargnon⁴ daily intubation had to be performed before the stricture was permanently dilated.

Navratil¹⁵ and Zwillinger¹¹ have reported cases in which the epiglottis was pulled back (as in the writer's case) to such an extent that the laryngeal entrance was closed.

In Zwillinger's case, there were adhesions between the epiglottis and aryepiglottic folds. In Hubbard's case¹² a thyrotomy was performed and the membrane uniting the cords removed.

CONCLUSIONS.

a. Intubation is particularly useful in the cases in which the stenosis is not extreme, and when it is caused by a thickening and infiltration of the cords and ventricular bands, thus narrowing the glottis.

In some such cases intubation may be carefully used perhaps without preliminary tracheotomy.

b. When the stenosis is extreme, or when membranous adhesions exist between the cords, leaving only a very small opening, a tracheotomy should precede attempts to dilate the stricture from above. It is in such cases that a sudden edema may be fatal before an intubation tube can be properly adjusted.

c. Tracheotomy, followed by laryngo-fissure offers the best chances of a permanent cure when there is much cicatricial tissue occluding the glottis by uniting the cords.

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XLII.

A CASE OF INFECTIVE THROMBOSIS OF THE SIGMOID AND LATERAL SINUSES AFTER ACUTE MASTOIDITIS. DEATH FROM MENINGITIS. AUTOPSY REPORT.*

BY ARNOLD KNAPP, M. D.

NEW YORK.

In no intracranial complication of purulent otitis has greater advance been made than in sinus thrombosis, both in comprehension of the morbid process and in operative extension of the treatment. Notwithstanding, the following is a report of a case unsuccessfully operated upon, in a measure due to errors in judgment on the operator's part. As the report is a complete one and mistakes if properly interpreted are always instructive justification for its publication is given.

J. A.; male; aged twenty-four; Italian; was admitted to the New York Ophthalmic and Aural Institute on January 26, 1905.

Present Illness: About three weeks ago, after exposure to cold, the patient felt pain in his left ear. A paracentesis was performed, discharge followed and patient returned to work. Yesterday and today he has felt quite ill, and has had chills.

Condition on Admission: A well-nourished young man; flushed face; anxious expression; excited. The region of the left mastoid is very tender. The tenderness extends downwards and backwards where the pain is apparently most severe. The head is held in a constrained position. There is moderate discharge from the left ear. Mt. bulging. Anterior perforation. Canal normal. T. 104.6°. P 120. Eye-grounds normal.

Diagnosis: The painful swelling posterior and inferior to the mastoid with rigidity of the neck point to an infectious process in the posterior cerebral fossa. This taken in con-

*Presented before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

junction with high fever and the history of chills makes the diagnosis very probable of a perisinuous abscess complicating an acute mastoiditis.

Operation January 26, 5 p. m. Ether. To the usual incision, one extending directly backwards from the center is added. The periosteum is easily detached, as it is unusually loose. The cortex is dry. On removal of the cortex over antrum serous fluid exudes. The same fluid is contained in all of the mastoid cells. The mucous membrane in these cells is greenish and detached from the underlying bone. Free hemorrhage from the mastoid emissary vein. The sigmoid sulcus is distinct and seems transparent in places. On making an opening through this bone thin fluid pus appears, which was collected between the sinus wall and the bony sulcus. The mastoid process showed a pneumatic structure with well developed tip and zygomatic cells. These were completely removed. The antrum was small. There were some granulations in the aditus. External semi-circular canal was exposed. The dura above this unavoidably laid bare. The bone over the sinus was then removed. The sinus wall for one inch in length was discolored and mottled, but without any granulations whatever. Exposure of the sinus was continued in both directions until healthy parts were reached. The sinus was soft and compressible.

The microscopic examination of the pus revealed diplococci in capsules.

Subsequent Course: On the following day the patient was restless, complained of pain in the wound; the temperature remained at 104°, pulse at 90. The temperature then came down gradually, and from the third day on it was nearly normal.

February 2. First dressing. The sinus appears to be covered with healthy granulations.

February 4. The patient complains of headache, and feels chilly. His temperature shot up to 104°. On the following day the wound was dressed. There is some swelling of the soft parts in the digastric fossa. On the following two days the fever continues, but is less. He still complains of headache and seems peevish. On the 7th the temperature was normal. On the 8th and 9th the temperature gradually rose to 103° with a chill. The region below the mastoid is swollen. There is some tenderness posteriorly and inferiorly. He com-

plaints of headache, does not take his nourishment well and seems to be failing physically.

Operation February 10: The wound is covered with flabby granulations. After these are scraped away the sinus is bare and protrudes like a solid sausage-shaped mass. The bone is removed along the course of the sinus posteriorly and down towards the bulb. The sinus is then incised. It is firmly clotted with a thickened outer wall. The outer wall is excised and a fairly healthy looking clot removed. In the center it is white and soft. A curette passed into the region of the bulb removes an apparently healthy clot from the dome of the bulb, but hemorrhage is not obtained. Passing backwards a clot is seen in the superior petrosal vein and at about a distance of one inch posterior to this, free hemorrhage takes place and the current is re-established.

The eyes show some swelling of the disc. In the evening the temperature was 104° ; pulse 120.

On the following day he was very much better. He took his nourishment, but in the evening, after two chills in an interval of half an hour, the temperature rose to 105.6° ; pulse 92. The region in the neck below the bulb shows absolutely no abnormality.

Operation February 12: The regular vein is exposed at the cricoid cartilage. It contains fluid blood. It is doubly ligated, divided, and the upper end dissected up as far as possible. A gland is removed. The upper end is left in the upper part of the neck wound. At 9 p. m. the temperature went up to 106.4° .

On the following day he complains of pain in the head, ear and throat. The respirations are more rapid and at 6 p. m. an infusion of $1\frac{1}{2}$ liters of salt solution is made. In that evening the temperature rose to 108° . The eye-grounds are normal. Palpation about the wound and in the neck is negative.

Operation February 14: The sinus is followed back toward the torcular. An apparently healthy clot is removed and free bleeding occurs. The orifice of the superior petrosal sinus is curetted. From the region of the bulb very little can be obtained. The upper end of the jugular vein is slit open and a probe introduced to the base of the skull. The bulb is syringed with great care without evacuating clot or pus.

On the following days the patient is delirious with periods .

of coma; great restlessness; general twitching; herpes labialis; right hemiplegia; involuntary passage of urine. Died on February 17, at 2 p. m., with symptoms of meningitis.

Autopsy February 17, 5 p. m.: A purulent exudate is present over the convexity of the brain, especially anteriorly, with considerable edema, fluid serum and enormously dilated veins. The superior longitudinal sinus is not thrombosed. Pus in the form of thick membranes is found in the posterior cranial fossa, especially about the anterior extremity of the right cerebellar lobe, on its superior surface and in the floor of the fossa. The dural surface of the lateral sinus shows no macroscopic lesion. On following the lateral sinus back, it is seen to contain pus and broken down clot with disease of the sinus wall directly anterior to the torcular. An unusually large set of veins given off from the left lateral sinus ramify over the tentorium. These veins are dilated and one is thrombosed. The other sinuses contain fluid blood. The left temporal bone is removed together with the jugular vein. The vein in its upper part contains a recent clot, its walls are somewhat discolored. The bulb contains a moderately disintegrated clot; the walls show no gross lesion. No extension from this area is visible.

Remarks: In this case the peculiar condition of the mastoid cells first of all attracts our attention. The cells and the antrum contained dark serous fluid not pus. The mucous membrane was greenish and separated from the underlying bone. This is evidence of severe infection which leads to necrosis without the formation of granulations. A distinct perisinuous abscess was present between the sigmoid groove and the sinus wall. The sinus wall was discolored and mottled without any evidence of the formation of granulations. It offered, in other words, no barrier to the absorption of infectious material which in this case produced the fever and the chills. As the sinus was compressible and soft it seemed justifiable not to open the sinus, but to await developments. On the following days the temperature came down and the symptoms seemed relieved until on the eighth day after the operation, namely, the day after the first dressing, there was some rise of temperature. During this period the thrombosis probably was developing from an affected sinus wall or a parietal thrombus. It was not until the eighth day after the operation when the temperature rose, and thus the first

symptoms of disintegration of the clot became manifest. As the patient's pulse remained perfectly normal the gravity of the condition was not recognized. It is the opinion of no less an authority than Grunert that the pulse-rate gives us the most important clue as to the intensity of the pyemic process. In the following days the temperature came down as is seen on the chart and the operation was delayed until on the ninth day, when with sudden rise of temperature and a chill the patient's marked depreciation of health became noticeable. The sinus was then exposed and a firm clot removed, which only in its center revealed any softening or discoloration. The region of the jugular bulb was curetted without producing any return flow of blood. The removal of the clot in an opposite direction was followed by an apparent re-establishment of the circulation. The cerebral side of the sinus showed no macroscopic changes. The pyemic manifestations were not checked, the temperature continued to show intense variations with chills, and two days later the jugular vein was ligated. The patient had never exhibited any symptoms either in the neck nor in the upper part of the jugular vein indicative of a bulb thrombosis. It seemed, however, inasmuch as free hemorrhage had occurred from the torcular side of the sinus, that the source of infection must be located in the bulb. The normal jugular vein was ligated and the upper extremity followed up; an attempt to syringe out the bulb was made without evacuating any clots. The septic manifestations continued. The temperature rose to 108° . The jugular bulb seemed to show no active inflammatory signs, the continued source of infection had to be placed in the lateral sinus so this, at the third operation, was still further exposed and another disintegrated clot removed until the current was again re-established. On the following days the temperature showed no further variations, but remained between 102° and 103° , while symptoms of meningitis became manifest and patient died.

At autopsy a diffuse purulent meningitis was found. The cerebral side of the sigmoid and lateral sinuses showed no macroscopic lesion indicative of an extension of the purulent process. The sinuses contained fluid blood except the left lateral sinus, which in the unexposed area between the wound and the torcular showed a disintegrating clot and distinct disease of the internal sinus wall. One of a group of veins

ramifying in the tentorium was thrombosed. The bulb was carefully examined and was found to contain a slightly disintegrated clot without advanced signs of disease in the walls.

It seems to me that this case is instructive from the following points: The first is the confirmation of Leutert's assertion that a rise of temperature persisting for more than a day or two in the usually afebrile course of an aural suppuration is always connected with disease of the sinus if we can exclude a superficial infection, pus retention in the tympanum or purulent meningitis, and we unquestionably erred gravely in not opening the sinus sooner than we did.

Second, the macroscopic appearance of a clot does not always indicate its harmlessness. Though it seems hardly proper to consider every clot as septic, for we must remember that the formation of a thrombus is a natural process to protect the body from infection by way of the blood vessels, still by so doing possibly less errors of omission would be committed.

As to the value of the so-called re-establishment of the circulation. It is generally stated that in dealing with a thrombosis the thrombus has to be removed with the curette until the return flow of blood is re-established. This may remove all of the infectious material in many cases, at the same time it does not necessarily cure a parietal thrombus or localized disease of the sinus wall, and arrest the pyemic process. In the above described case, notwithstanding the re-establishment of the circulation at two operations, infectious clots reformed from a diseased sinus wall in the unopened part of the sinus near the torcular, as was shown at autopsy. It would seem to me much safer in cases of unquestionable infective thrombosis in the lateral sinus, to expose this sinus to the torcular, then shut off the circulation at that point by firm pressure and to excise the entire external wall of the sinus. Any remaining disease of the inner sinus wall can then be most readily observed and treated, additional infectious clots cannot form, and on the other hand the danger of a meningeal extension is diminished.

Word

NEW YORK OPHTHALMIC AND AURAL INSTITUTE

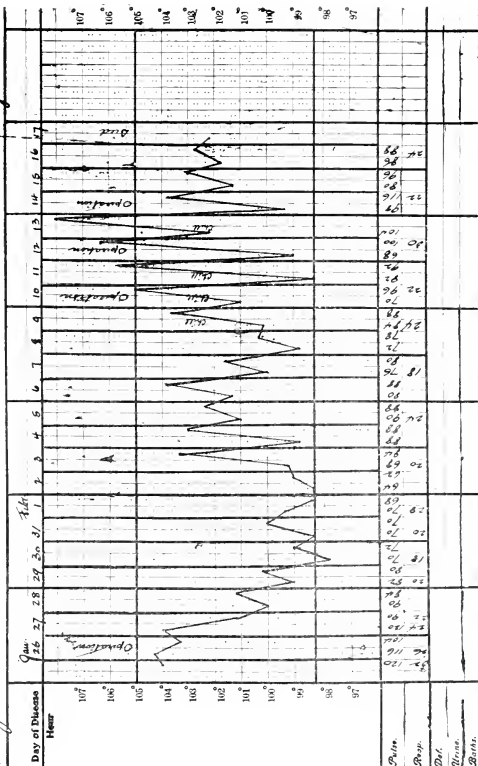
49 EAST 12TH STREET

Diagnosis *Ca. Mastoiditis Sinus Thrombosis*

Name *John Ambrosia*

Meningitis

Admitted Jan 26 '05



SYMPOSIUM.

Intracranial Complications of Middle Ear Suppuration.*

XLIII.

MENINGITIS: ITS SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT, WITH REPORT OF A CASE.

By S. MACCUEEN SMITH, M. D.,

PHILADELPHIA.

The clinical picture of meningitis was well known to the physicians of antiquity, but owing to a lack of anatomic study, it could not well be differentiated from other diseases of the brain. These studies were begun and completed in the middle of the eighteenth and, in the main, at the beginning of the nineteenth century. Robert Whytt, of Edinburgh, in 1768, was probably the first to clearly differentiate the clinical picture, and he described a number of cases in children of acute diseases of the meninges which coincided quite accurately with our knowledge of tuberculous meningitis. By succeeding study, particularly on the part of the French and German investigators, the pathologic anatomy and symptomatology were developed to the point at which we find them today. In comparatively recent times attention has been chiefly directed to the bacteriologic origin of the disease. The tubercle bacillus, after its discovery by Koch, was readily proven to be the pathologic agent of tuberculous meningitis, and quite a number of other micro-organisms were found in meningeal exudates and the cerebro-spinal fluid. Among these, the diplococcus intracellularis meningitidis and the pneumococcus play the most important roles. The diagnosis of the affection has been greatly facilitated by Quincke's ingenious invention of lumbar puncture. The method has not only been of value in diagnosis, but in the treatment of the condition as well.

*Read before the American Laryngological, Rhinological and Otological Society, Boston, 1905.

Clinically we distinguish between epidemic, suppurative, tuberculous and serous meningitis. Meningitis from aural disease differs from that due to other causes chiefly in that the symptoms are more severe and may be relieved by operation. Jansen states that pachymeningitis externa purulenta is the most common variety. It occurs twice as frequently with chronic diseases of the tympanum, as it does with the acute form. In this variety of meningitis a large proportion of the cases are insidious and without symptoms aside from those of the ear, and therefore, are not discovered until after operation; but on the other hand, they may begin with a chill and fever. Localizing symptoms are rare. Extension to the meninges may take place in one of three ways: (1) through carious openings in the skull; (2) through the natural communications, viz., the cochlea and semicircular canals, and (3) the infection may travel along the blood vessels and connective tissue. The cerebrum is affected when extension occurs through the roof of the tympanum; the cerebellum when it travels through the inner wall of the labyrinth. The most common mode of infection is either through the inner wall of the mastoid or through the roof of the antrum or tympanum. Jansen states that chronic aural disease affects the posterior fossa twice as often as the middle, and that acute aural suppurations affect the posterior fossa almost exclusively.

Leptomeningitis often occurs with sinus phlebitis, brain abscess or pachymeningitis, but is usually complicated only by encephalitis. This latter occurs in two forms: (1) the apoplectiform, which is fatal in from a few hours to three days, and (2) the insidious form, lasting from two to three weeks. Diagnosis of the latter is very difficult until serious disturbances of the sensorium have presented themselves. According to Macewen, leptomeningitis may occur without any visible tract along which the inflammation has traveled. In these cases the infection has been carried by the vascular system. Acute processes less frequently extend into the interior of the skull because the mucous membrane of the tympanum remains intact, but when this complication does occur it is due to the fact that the process has been sufficiently acute to cause thrombosis of the vessels.

Macewen further gives the mode of extension from the tympanum in chronic cases as follows: caries of the tympanic cavity does not usually affect the bone equally on each side,

but extends in certain directions. When the roof is attacked by the ulcerative process, a perforation is likely into the middle fossa of the skull. This osseous ulceration may go on for some time and perforation occur only after some injury has been received upon the skull in that region. Suppurative leptomeningitis of the basal ganglia and cerebellum may occur from extension along the sheaths of the facial and auditory nerves. The cochlea and semicircular canals, being surrounded by harder bone, are seldom attacked, although they may be in the tuberculous variety and following this a tuberculous meningitis may be set up. Osseous ulceration may occur either in the carotid canal or in the roof of the jugular fossa. The most frequent points of perforation are the tegmen over the tympanum or antrum and the sigmoid groove. When the dura is exposed by these perforations it throws out granulations to protect itself and assist in the absorption of disintegrated bone. This granulation tissue, when seen through the external auditory canal, may be mistaken for an aural polyp and removed with a snare, thus setting up an irritation which will produce a meningitis.

Meningitis serosa is a form of meningitis which can be distinguished from other varieties only after it has suddenly cleared up, either spontaneously or following operation.

Barker expresses himself as being of the opinion that hardly one-tenth of the intracranial complications of aural disease are brain abscesses and that more than nine-tenths are made up of meningitis, septic phlebitis and pyemia.

Meningitis manifests itself in a protean manner. Occasionally the symptoms are so typical that it is impossible to mistake the affection, and, at other times, they develop in such a latent form that only with the greatest difficulty and by the most careful attention to the etiology can a tentative diagnosis be made. This explains why, at the autopsy, the serous membranes of the brain are so often found involved when such a condition had not even been suspected *intra vitam*; and, on the other hand, the membranes are found pale and glistening in some cases in which the most marked cerebral symptoms have accompanied the affection. Since the disease, as a rule, represents a diffuse affection of the surface of the brain, it produces general symptoms; and, as in the preponderance of cases, certain portions of the cortex are implicated, or the affection is propagated to the cerebral substance, focal symp-

toms also develop. The diagnosis, therefore, necessitates the proper appreciation of both of these groups of phenomena. The general symptoms which may precede or accompany the focal symptoms are headache, fever, vomiting, slow pulse, respiratory disturbances, jactitation, epileptiform convulsions, general hyperesthesia, delirium, involuntary discharge of urine and feces, and phenomena which are almost focal, such as tetany, grinding of the teeth, rigidity of the extremities and retraction of the muscles of the neck.

Headache is the most constant symptom. It is due to pressure upon the dura, to inflammatory edema of the brain substance, or to an accumulation of fluid in the ventricles. It is always decided, and while the patient is conscious his most persistent complaint is of excruciating and tormenting headache. Even when in a comatose condition we often note that the patient grasps his head with his hands. Only in exceptional cases is headache absent or even less intense.

Convulsions and muscular twitchings are prominent. The muscular twitchings may assume the form of epileptiform convulsions; delirium is common, and, particularly in children, a peculiar cry with which they sometimes start from their coma, is characteristic; it has been called the "hydrocephalic cry."

The pulse, especially at the onset of the disease, is slow and this is all the more significant when fever is present; in the later course of the affection the pulse becomes more frequent, irregular and smaller. The temperature fluctuates markedly, varying between 101° and 106° F. The respiration is early influenced; it is increased in frequency, sighing, and finally becomes intermittent and may assume the Cheyne-Stokes type. Vomiting is common and shows the peculiarity that it is most prone to occur when the patient assumes the upright posture; as a rule it is not accompanied by nausea and often, with quite persistent vomiting, the tongue is observed to be clean. Vertigo is also a frequent symptom. Occasionally there is inability to swallow. Contraction of the pupil is often very decided. The latter is probably a spastic myosis, due to an irritation of the cortical origin of the oculomotor nerves.

A symptom which is almost invariably present is painful contraction of the muscles of the neck. This often confirms the diagnosis and is produced by an irritation of the nerve

supply of the muscles of the neck and particularly the spinal accessory nerves. Phenomena belonging to the same category as the rigidity of the muscles of the neck are trismus, grinding of the teeth and spastic contraction of the abdominal muscles. The latter condition gives rise to the scaphoid retraction of the abdomen. Rigidity of the muscles, particularly of the extremities, and convulsions restricted to definite portions of the body are common symptoms. Hyperesthesia of the skin and muscles must be grouped with the most important diagnostic phenomena. This is particularly noticeable in the muscles of the neck and of the calves. The reflexes are at first increased, later decreased and may finally disappear altogether towards the end of the disease. The presence of Kernig's sign has, in recent years, been included among the symptoms of meningitis, although its value should not be overestimated, as it is sometimes absent in well-marked cases of meningitis and is occasionally found in other conditions. Trophic and vasomotor disturbances in the skin are sometimes met with, and among eruptions herpes is the most common.

Constipation is the rule; later in the course, involuntary evacuations occur. The urine is excreted in small quantities and sometimes contains albumin. Sugar has been demonstrated in a few cases, and by some authors a remarkable increase in the amount of phosphoric acid has been noted. Extreme emaciation, often very rapid, is common, and is probably due to the cerebral effect upon the processes of metabolism.

The focal symptoms relate to paralysis of the motor area; occasionally monoplegias and hemiplegias are observed. Motor aphasia is not infrequent. As soon as the meninges in the neighborhood of the optic nerve become implicated the clinical picture of optic neuritis develops.

The symptoms naturally vary according to the principal situation of the meningitic inflammation. The convex portion of the brain is generally affected by suppurative disease, while basilar meningitis is much more likely to be of a tuberculous nature. It must not be forgotten that the spinal meninges are in many cases involved with those of the cerebrum, so that symptoms referred to the spinal cord are superadded to those developing from the brain. Suppurative meningitis is most commonly produced by contiguity, by way of the lymph-

vessels or of the veins, and is due to caries of the petrous portion of the temporal bone and purulent inflammations of the middle ear. It may also be due to purulent catarrhal inflammations of the frontal sinus, operations upon the nose, the orbits, or in the aural cavity, to trauma, particularly fractures at the base of the skull, to wounds, to furuncles and to abscesses of the scalp.

The following* differential diagnosis between meningitis, brain abscess and sinus thrombosis, compiled mostly from Barr, is interesting in this connection:

As to the treatment, apart from employing general methods, such as the use of rest and the application of cold, very little can be accomplished. Surgical interference is naturally indicated in most cases of meningitis complicating aural disease. This procedure however is satisfactory only in a very small percentage of cases, chiefly from the fact that the serious nature of the ear disease is not recognized until the meningeal inflammation has become well established.

Some authorities claim that *all* cases of *infectious* meningitis terminate fatally. The writer's experience would not only seem to confirm this observation, but also to establish the belief that cases which recover after operation are those which have been termed "meningeal irritation" rather than cases of true infectious meningitis.

A recent addition to our therapeutic resources is the operation of lumbar puncture. According to Quincke, the inventor of this method, the operation is indicated in the following conditions:

1. In cerebral pressure, with threatening symptoms, where it is desirable to relieve the pressure.
2. In moderate, long-continued pressure.
3. In conditions in which increased pressure is assumed or suspected.
4. In cases in which it is desirable to examine the cerebrospinal fluid independent of the cerebral pressure and thus obtain an opinion as to the nature of the meningitis.
5. In cases in which the fluid is to be examined for diagnostic purposes (blood, toxins, agglutinins, etc.).
6. For the purpose of injecting fluids into the spinal canal as therapeutic agents.

In the treatment of meningitis, lumbar puncture is employed largely for the purpose of relieving pressure, and in some cases

*See tables, pages 50 and 51.

MENINGITIS.

Pain is an early, severe and persistent symptom. Generally frontal and extends towards the vault, although it may be localized and correspond to the affected area.

PAIN.

TEMPERATURE.

The fever in this condition does not attain a great height, nor is it characteristic.

PULSE.

The pulse is in the majority of cases very rapid, but if there is local pus formation it will become slow.

RESPIRATION.

The breathing is very short and rapid and takes on the Cheyne-Stokes variety.

RIGIDITIES.

Rigidity of the muscles of the back of the neck and retraction of the head usually accompany meningitis. There may be convulsions with loss of consciousness to a greater or less degree.

BRAIN ABSCESS.

Onset marked by sharp, severe pain in ear, which extends over side of head and develops into excruciating head pains, increasing on pressure or percussion. It does not disappear as long as patient remains conscious.

Temperature is at first high, then drops to normal and so continues until abscess ruptures, which is followed by a rise.

In early stages pulse is rapid, but after 2nd or 3rd day becomes very slow and again in the final stages increases greatly in rapidity.

Breathing here is very slow, deep and stertorous.

May be local rigidity of certain groups of muscles in the extremities.

SINUS THROMBOSIS.

Pain is produced in this condition by pressure or percussion over the posterior part of the mastoid. This may extend down the neck along the course of the jugular vein. Headache is generally present but it is not characteristic.

Fever is very high, with great oscillations, ranging between 100-102° F. and 105-106° F.

Here the pulse is exceedingly rapid and as the condition continues it becomes very small and weak.

Respirations in this condition are not affected.

Rigidity is not, as a rule, present in uncomplicated cases.

CHILLS.

Sensations of chilliness and shivering are present, but not to a marked degree, although the onset may be shown by a distinct chill.

Rigors present to about same extent as in meningitis.

Chills in this condition are very severe and are frequently repeated and may be of one-half hour duration. They are followed by profuse perspiration.

GASTRIC DISTURBANCES.

Vomiting is almost invariably present. It is of the cerebral type and does not depend upon the taking of food. The accompanying digestive symptoms are constipation, and anorexia.

Vomiting of same character, but more severe and persistent. Digestive disturbances are likewise sympathetic and abdomen may be retracted.

Vomiting in this condition is generally present in the early stages, but is not severe. The tongue is dry and heavily coated and there is severe diarrhoea. These symptoms somewhat simulate enteric fever except that headache is more severe.

OCULAR SYMPTOMS.

Optic neuritis is not uncommon, but cannot be depended upon as a symptom of value.

Almost invariably present. In early stages photophobia, later inequality of pupils with dilatation affected side. Neuritis common later stages. Very frequently lids do not close entirely and eyeballs roll upward.

No special ocular phenomena.

NERVOUS SYMPTOMS.

Dizziness may be present in the early stages. The patient is extremely restless and often lapses into an excited delirium.

Dizziness is not infrequently found. The intellect is not, as a rule, interfered with except in complicated cases.

COURSE.

It may end fatally in three or four days, or it may last for two or three months. The average case is probably about two weeks.

This condition usually terminates in from two to three weeks, although the period may be much shorter. Death is usually due to pyemia or metastatic abscesses of liver, lung, kidney or brain.

of non-infective meningitis, uremia, etc., actually startling results have been reported.

The writer's own experience leads him to believe that lumbar puncture is of value chiefly as a means of diagnosis. The cerebro-spinal fluid has a normal specific gravity of about 1.010 and contains little or no albumin. In meningitis the albumin is greatly increased, while in cerebral abscess it is only slightly increased. It is claimed that the presence of more than one per cent is pathognomonic of meningitis.

The history of one case which I desire to report is as follows:

A. S., female, white, aged 6 years. Three years ago the child had an attack of pneumonia, complicated by an acute suppurative otitis media involving both ears. The discharge ceased in about two weeks.

Six weeks previous to admission to the hospital the patient became peevish and irritable; complained of pain over the eyes, in the frontal region, and in the right ear. After three weeks of more or less severe pain, a spontaneous rupture of the right membrana tympani occurred, relieving the aural pain, which, however, exerted no favorable influence upon the suffering referable to the frontal and occipital regions. Prior to, or immediately following the appearance of the suppuration, the attending physician noticed some tenderness and swelling over the mastoid region; this however, subsided within a day or two so completely as not to attract further attention.

Following irrigation, the discharge ceased at the end of one week. By this time the headache had become general, the pain being especially severe in the occipital region and the neck.

On admission the temperature was 103° F.; pulse, 120; respiration, 24. The child was drowsy, stupid, and not easily awakened. Examination of the right ear failed to disclose any discharge or other evidence of tympanic or mastoid disease except slight redness and bulging of the superior and posterior wall of the canal. Traction on the auricle or pressure over the mastoid failed to elicit any outcry or other evidence of pain. The patient rested quietly that night and during the ensuing day, but on the second night became restless and started up from time to time with a shrill scream, relapsing into stupor. This condition persisted for most of the second day, when the patient became more quiet, but developed marked rigidity of the muscles of the neck with strong retraction of

the head. Marked and almost continuous twitching of both arms and legs now became prominent symptoms, as well as involuntary evacuation of bladder and bowels.

In this condition the writer saw the patient and advised an immediate mastoid operation, his diagnosis of mastoid involvement being based on the history of the ear having previously discharged, more especially, however, upon the characteristic drooping of the superior and posterior wall of the canal. The cortex was somewhat harder and thicker than usually encountered in a child of her years; the tip was not involved. Neither pus nor other inflammatory debris was found until the antrum was reached. A small carious opening through the roof of the antrum exposed a moderately inflamed and pulsating dura. The radical operation was performed, but no evidence of further intracranial involvement was discovered. For two days following the operation the patient improved only in one respect, namely, the reduction of the temperature by two or more degrees. However, on the third day after operation the patient attained a gradual rise of temperature, starting at 103 degrees F., at two a. m., reaching 107 degrees F. and a fraction by eight p. m., when death relieved her suffering. The moribund condition of the patient was so far advanced that little or no anesthetic was required. The post-mortem findings would have been interesting, but unfortunately an autopsy was refused.

In conclusion, the writer would strongly urge on the part of the medical profession a more careful and better conception of the serious complications that frequently develop from diseases of the tympanic cavity that are regarded, from the symptoms presented, as simple in nature.

All suppurative processes of the organ of hearing should be considered a menace not only to the health but actually to the life of the individual thus afflicted. The importance of this doctrine is not in the least lessened from the fact that we see many cases of otorrhea that have persisted for years without having caused appreciable harm. The ultimate outcome of many such cases is too well known and appreciated to admit of any controversy. After all, the most reliable treatment for meningitis complicating aural disease, and other intracranial lesions from the same cause, is to promptly recognize and properly treat the initial ear disease.

SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT OF ENCEPHALITIS AND BRAIN ABSCESS.

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The term encephalitis seems to have several distinct meanings. In the first place, there is the so-called polio-encephalitis, superior and inferior, in which the cranial nerve nuclei of the pons and medulla respectively are destroyed either suddenly (acute polio-encephalitis) or gradually (subacute and chronic polio-encephalitis). With this form allied to polio-myelitis or infantile paralysis, otologists have little to do.

In the second place there is the acute exudative encephalitis (hemorrhagic encephalitis) described by Dana¹ as following influenza, cerebro-spinal meningitis, typhoid and other infectious fevers. This apparently never results in suppuration.

Thirdly, and of special interest to otologists, comes the acute suppurative encephalitis, a term synonymous with cerebral abscess.

This form of encephalitis, an end result of the extension from the ear cavities of pyogenic micro-organisms either directly, or along the blood vessel, furnishes together with meningitis, a diffuse result of similar infection, the principal cause of fatal outcome in the cases with which we have to deal.

Dana states that abscess occurs oftenest between the ages of ten and thirty, and this corresponds with my experience. I have tabulated according to the age of onset, forty-three cases occurring at the Massachusetts Charitable Eye and Ear Infirmary, the Boston City Hospital and the Massachusetts General, and find that thirty-two cases occurred between ten and thirty, and eleven between thirty and sixty.

Prior to the appearance of Macewen's² treatise, the subject of suppurative infection of the meninges and brain, resulting from disease of the middle ear, had not received the system-

atic attention it deserved, though many cases had been reported and the subject of brain abscess had been by no means neglected in the literature. This is not surprising in view of the universally hopeless prognosis of these conditions, both with and without operation.

A new impetus to the study and a fresh incentive to operation were aroused in 1893 by the work of this author, whose elaborate presentation of the subject from the pathological, symptomological and operative point of view, placed it for the first time on its proper plane, whether regarded from the scientific or from the purely practical standpoint. The increasing interest in this subject as well as the improvement in prognosis appears from the statistics gathered by various writers. Up to 1889 von Bergmann³ found only eight successful operations on brain abscess of otitic origin; up to 1894 Koerner⁴ had collected only 55 cases of operation both successful and unsuccessful; in the following year he had increased this number to 92. In 1898 Marsch found reports of 60 successful operations upon temporal and 12 upon cerebellar abscess.

The prominent symptoms of brain abscess are headache and vomiting, with normal or subnormal temperature in uncomplicated cases, slow pulse, progressive mental deterioration, mental dullness passing into apathy and eventually into coma, preceded or accompanied by convulsion. Pupillary changes, ocular paralysis and optic neuritis may appear, the latter less frequently than in tumor. Hemiplegia sometimes completes the picture, and generally denotes extension from the temporal lobe inwards upon the internal capsule.

The usual seat of abscess is in the temporo-sphenoidal lobe over the tegmen tympani, and in this direction the exploratory operation proceeds unless definite symptoms of cerebellar disturbance point to invasion of that organ. Such symptoms following ear disease demand prompt surgical interference. It is true that in rare instances a small abscess may be absorbed, or a large one near the surface may discharge spontaneously, but this chance is too remote to justify expectant treatment.

Trephining over the squamous portion of the temporal bone is not always necessary for the evacuation and complete discharge of the abscess and removal of all symptoms. This point is of practical interest in view of the following conclusion of Macewen⁵ with regard to the operation through the tegmen tympani: "Such an opening into the cerebrum suffices

for temporary purposes, but though it always ought to be made in order to eradicate the source of the infection, it is not safe to trust to it alone, as in many cerebral abscesses there are sloughs of brain tissue which cannot be easily removed in this way, but require a larger opening in the skull for their evacuation."

The case which forms the basis of this opinion is sufficiently important to place on record.

J. W., newspaper reporter, married, 25 years old, of Boston, presented himself at the clinic of the Massachusetts Charitable Eye and Ear Infirmary July 31, 1901.

History: The left ear had troubled him for three years. There was a discharge last winter which ceased up to six months ago, when it reappeared. During the last six weeks he suffered with frontal headache, but there was no pain in the ear until two days before admission to the Infirmary, when he awoke from a sound sleep with a severe headache.

Examination showed a small amount of pus in the auditory canal. The walls of the canal were slightly swollen, but not especially tender to pressure. Landmarks of the drum membrane were obscured by swelling. The posterior segment of the drum was red and bulging. The mastoid was tender to touch over the tip and antrum, but not swollen.

The hearing tests were as follows: Watch not heard; the hearing for the voice was reduced about one-half. The tuning-fork by air conduction was only heard one-twelfth of the normal time (T. F. 512 V. S. A. C.=20 "heard 1"). Bone conduction was normal (B. C.=10 "heard 10"). Tuning-fork applied to the skull was heard louder in the affected ear (Weber F. 256 V. S. louder in the left ear). The test by Galton's whistle was normal. The low tuning-fork was not heard (V. S. 192).

Severe headache appeared in a few days. The mastoid tenderness, however, gradually disappeared and also the swelling in the canal. The temperature fell from 101° F. on August 1 and remained at 99° F. for several days. The pulse during this time varied between 60 and 70. On August 7, seven days after opening the drum, the patient had a chill and complained of intense frontal headache. The temperature quickly rose to 102° F., pulse 90.

Extradural Operation: Under ether the usual mastoid in-

cision was made and the periosteum was divided. A deep opening was necessary through sclerosed bone the entire distance. The antrum was found filled with pus. On enlarging the opening above, and posteriorly, softened bone with granulations and purulent matter were found. With chisel and curette the bone was removed from the middle fossa for over a distance of one inch in length, and a half-inch in breadth. The lateral sinus was also exposed about an inch. This was necessary in order to thoroughly remove all diseased parts.

The dura was normal in color and without bulging. The wall of the sinus showed nothing abnormal. The neck of the antrum was enlarged and the middle ear carefully curetted, removing the incus together with masses of cholesteatoma. The wound was irrigated with a bichloride solution (1 to 3,000) and sterile water and dressed in the usual way.

Bacteriological Report: Mixed infection.

For a few days after the operation the patient's symptoms improved. The temperature on the following morning was 100° F., the pulse 80. He complained, however, of severe headache (frontal). The ice bag afforded some relief.

August 16, at 4 a. m., on the eighth night after the operation, the patient was found pulling and pushing the bedclothes and could not be roused. The pupils were equal and contracted, but reacted to light. Temperature 98° F., pulse 102, thin and wiry. The temperature suddenly rose to 103° F., and the pulse fell to about 60. The patient was perfectly quiet and deeply comatosed for four hours before operating.

Intradural Operation: The wound was reopened upwards over the squamous bone and posteriorly for about two inches towards the occipital protuberance. The skin and periosteum were retracted so that the skull above the mastoid was fully exposed. With chisel and rongeur forceps, bone was removed so that a larger surface of the middle cranial fossa was exposed than at the previous operation.

There was bulging outwards of the dura most marked over the tegmen tympani. No opening could be found in the dura. A hypodermic needle was passed twice upwards into the brain before pus was drawn into the syringe. A narrow knife was then entered at a point over the tegmen and passed upwards about one inch into the brain. The opening was enlarged by forceps and over four ounces of foul pus and sloughing brain tissue were evacuated.

The abscess cavity was thoroughly irrigated with a solution of carbolic acid (1 to 40), then one of bichlorid (1 to 3000). After all necrotic material had been removed the dural wound was wicked with a small piece of iodoform gauze. The wound over the skull was partially closed by sutures, and the cavity of the mastoid covered with thin rubber sheeting packed with plain gauze and dressed.

August 17.—The temperature rapidly fell to 99° F. in twelve hours, and the pulse ranged between 60 and 70. The patient was quiet during the night and seemed rational at times. Answered when asked if he had any pain. The wound was dressed, and upon removing the wick about one-half ounce of fetid pus discharged from the abscess cavity in the brain. The cavity was washed out and dressed.

August 18.—The patient recognized his attendants this morning. Temperature 100° F., pulse 75. The wound was dressed daily, and every possible care taken of his general condition.

August 22.—During four days the patient had complained of headache (frontal). The temperature varied slightly between 98° and 99° F., pulse good. He had been less rational, and at times was roused with difficulty. The discharge of pus from the abscess cavity was becoming less in amount, and the brain was found somewhat bulging into the mastoid wound.

Examination of the Eyes: Pupils react normally to light. No hemianopsia. With homatropine the fundus of the right eye showed a slight swelling of the disc and tortuosity of veins, the left eye marked swelling of disc and tortuosity of veins. There was paralysis of left abducens muscle (eye would not rotate outwards beyond the median line). The patient stated, however, that the left eye had always turned inwards. The movements of the right eye were normal. In a few days showed signs of aphasia, which persisted for some weeks. When shown an object he was unable to name it, although he repeated the name when told. He also recognized a relative whom he had not seen for four or five weeks, but could not call her by name.

August 23.—Symptoms of imperfect drainage appearing, blunt scissors were inserted into the cavity of the abscess, and upon enlarging the opening there was a discharge of about two ounces of very foul pus. The cavity was irrigated and a rub-

ber drainage tube was inserted in place of gauze. The aphasia continued the same.

Recovery was uninterrupted, and the patient was discharged practically well September 12.

Remarks: Should the brain have been explored for the abscess at the time of operating upon the mastoid? Against such a step were absence of bulging of the dura or congestion and no visible erosion of the dura after careful inspection, especially over the area of the tegmen tympani. It is true that Wallace⁶ reports a similar case in which an abscess involving the greater part of the temporo-sphenoidal lobe failed to produce bulging of dura into the opening made by operation. It is perhaps, therefore, unsafe to regard this failure as an absolute contra-indication.

Up to the time of the operation all of the symptoms could be accounted for by the condition found, and it did not seem advisable to injure brain tissue. The abscess, however, undoubtedly existed at that time and was the cause of the headache.

This question was discussed at a recent meeting of the *Société Française d'Otologie de Rhinologie et de Laryngologie* in 1897.⁷ The prevailing opinion seemed in favor of delaying for a day or two after operating upon the extradural abscess. The suggestion was made, however, that the danger of infection through continuing the first operation into the brain might be obviated by applying the thermocautery to the spot through which the puncture was made.

The opinion of Macewen regarding the necessity of opening the squamous portion as well as opening through the tegmen tympani seems to be very generally shared. Review of available literature shows that the practice of trephining (or of opening by the chisel over the ear is practically, perhaps quite, universal, and it would be presumptuous to assume from this one case that the prevailing opinion was erroneous. That such an opening is not invariably necessary is certainly demonstrated.

A certain advantage is gained by avoiding the external opening, in that the danger of hernia is reduced to the minimum, though this consideration should not deter the operator if any question exists as to the complete evacuation of the contents of the abscess.

The opening through the tegmen sufficed not only for the

removal of a large amount of pus, but also of considerable sloughing brain tissue. That the evacuation and drainage were complete is shown by the perfect recovery.

The loss of brain substance resulting from sloughing of hernia of the brain seems not necessarily to impair the mental condition of the patient recovering from a brain abscess. Epileptic seizures at variable times after recovery have been noticed and reported. These attacks are undoubtedly due to pressure from cicatricial tissue. In one case under my observation the attack appeared six months after the operation, gradually growing less in severity and frequency.

Lumbar puncture is of undoubted diagnostic value in many cases. In my cases at the Infirmary, puncture made at the time of operation has shown an opaque, cloudy fluid, and this not only in cases of meningitis, but also in cases of sinus thrombosis. The same has been observed recently in cases of brain abscess; one reported by Grossman⁸ of Berlin, and another a recent one of my own, of recovery after operation.

This fact seems to indicate that finding of a cloudy fluid (*per se*) is not conclusive evidence of meningitis.

Micro-organisms may be primary or secondary considered in their causative relation. The diplococcus intracellularis of cerebo-spinal meningitis may be considered as primary, and is rarely seen by the otologist unless ear disease intervenes. The more common forms, streptococci, or mixed infection, are observed as secondary.

The abscess caused by ear suppuration, as has been already said, is almost invariably situated in the temporo-sphenoidal lobe from one-fourth inch to an inch within the substance of the brain, and directly over the roof of the middle ear, sometimes in the cerebellum from peri-sinusitis and rarely there is one in both regions.

The fatality is very great from failure in finding the abscess, from meningitis, secondary abscess, etc.

In the forty-three cases mentioned, a large percentage of the abscesses were situated in the temporo-sphenoidal lobe; the cerebellum was next in frequency, and rarely there was one in the frontal lobe. Of the whole number, all were operated upon, and there were seven complete recoveries.

Imperfect drainage seems often the cause of a fatal result, and in my experience gauze wicks are much less satisfactory than a rubber drainage tube. In the two cases of recovery mentioned the tube was used.

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SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT OF SIGMOID SINUS THROMBOSIS.

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In speaking of the symptomatology of this disease I shall do so under three heads; first the symptomatology in the typical cases, second in the atypical, and third in those where the bulb and sinus are primarily involved without macroscopic disease of the mastoid process. As most of the cases coming under our observation are those secondary to a mastoid involvement, or developing after the mastoid operation has been done, there are certain definite symptoms present which are fairly constant, and without much delay enable us to recognize this condition.

Temperature: The symptom which I consider by far the most important is that of temperature. This depends upon the amount of septic material entering the general circulation, which if it be large, is immediately followed by a rise from normal to 104, 105, 106, or even higher, and is quickly followed by a remission to normal or below. There may be only one rise during a period of twenty-four hours, or several may take place, depending upon the rapidity with which the poison is entering the general circulation. If the patient is kept under observation for several days these exacerbations of temperature become more frequent, and the variations greater.

Chills: They are present in only a certain proportion of the cases seen. When present, they usually precede the rise in temperature, and are followed by profuse sweating. Many of the cases coming under our observation exhibit no definite chill. They merely complain of a slight chilly sensation, and oftentimes this is overlooked, unless the nurse in attendance is on her guard and watching for such a manifestation. In a post-operative mastoid case with numerous temperature

variations, these chilly sensations are quite as important as though a decided chill were present.

Pulse: In cases of thrombosis, where there is a sudden and high elevation of temperature, there is a corresponding rapidity of the pulse rate, ranging from 120 to 170 per minute. In those of a lower temperature range, the pulse is often between 100 and 120, and when complicated (as oftentimes is the case) by a collection of pus in the brain, it is very much slower.

Respiration: During the earlier stages of thrombosis the respirations are little affected, becoming only slightly increased during the high temperature ranges.

Pain: In most cases of thrombosis coming under our notice the degree of pain is greater than that present when only an ordinary mastoiditis exists, or than that following the average post-operative case. The pain is usually referred to the side of the head, and to the occipital region, and is very frequently localized in the region of the torcular. When pain is present in the neck, I think it is usually due to the infected chain of lymphatic glands in this region, rather than to any obstruction in the vein.

Nausea and Vomiting: These symptoms are usually present at some stage of the disease, in a greater or less degree. The vomiting usually takes place at first, following the drinking of some fluid, but later on may occur at any time independent of the ingestion of solids or fluids.

Intra-Ocular: In about one-third of the cases coming under our observation the eye symptoms have been present, in the remaining two-thirds the eyes are negative. When puffiness of the eyelid on the affected side is present, it sometimes is caused by extension of the clot to the cavernous sinus, and also by an interference with the return ophthalmic circulation.

Vertigo: I have observed its presence only when the meninges are involved.

Cerebration: This has been normal except in advanced cases. We were formerly told to look for cerebral manifestations and believed they should exist in the majority of cases. This has not been my experience, for while the patients are drowsy, yet they answer questions intelligently when aroused, but do not wish to be disturbed. This drowsiness increases, however, if the disease is allowed to go on unchecked, and later there are distinct evidences of impaired cerebration.

Local Symptoms: We occasionally find the presence of edema in the mastoid region, and edema over and around the exit of the emissary and occipital veins. The symptom described by Gerhardt, and to which has been given his name, namely, that when pressure is exerted over both the external jugular veins it will show a marked increase of blood passing through the vein of the unaffected side, I have never seen demonstrated. In a fair proportion of the adult cases there is a marked stiffness of the muscles of the neck on the affected side, and in several instances aside from this stiffness I have observed a marked rigidity present.

Constipation: In all the cases coming under my observation, this symptom was present, and while a very common one, it is one that I believe coincided with the earlier stages of the disease. In the later stages of the disease, or when there is an advanced general sepsis, diarrhea is frequently present.

General Symptoms: Among some of the general symptoms at the outset of the disease may be mentioned malaise, loss of appetite, a dry and heavily furred tongue and a foul breath. The face wears an anxious and pallid look, the skin is dry, and later presents a yellowish tinge, indicative of sepsis.

Physical Signs: One of the physical signs which we have been told to watch for has been a hard cord-like swelling in the neck, along the course of the internal jugular vein, and when such a sign was present it denoted a thrombus of the vein. While unquestionably such a physical sign does occur, in the experience of the writer, it is a very infrequent one, as I have never been able to demonstrate such a condition along the course of the vein, though I have tried to do so repeatedly prior to operation.

The Atypical Cases: These are cases invariably following a mastoid operation, and usually do well for a few days after the mastoid has been opened. Then the patient becomes restless, irritable and disinclined to take food. The tongue, which before was clean and free from any coating, becomes dry around the edges and presents a whitish, glazed appearance in the center. The pulse increases from 100 to 130 per minute, and there is a slow, gradual rise of temperature to 103, 104, 105, or even higher, remaining so for several days. In some of the cases it will not vary a degree in twenty-four to forty-eight hours, while in others there is a little more varia-

tion in the temperature, but there are no sudden drops and no sudden rises. The patients complain of headache, and occasionally of nausea, but very few reach the vomiting stage. They are unable to sleep for any considerable period of time, and if surgical measures be not instituted they later show all the signs of pyæmia. There is no chill or chilly sensation present. Cerebration is clear, the only evidence of any mental disturbance being an occasional irritability of temper.

In the third class of cases there is an acute purulent otitis present, with the usual symptoms found accompanying this condition, and the subsequent symptoms detailed are the result of a direct infection from the tympanic cavity to the blood current closely adjacent, namely, through the floor of the tympanum to the jugular bulb. The explanation of the possibility of this is quite clear if we bear in mind the fact that in a certain percentage of the skulls examined we find an unusually high dome, encroaching upon the middle ear cavity, or a dehiscence may exist in this region. Under such conditions as these, it can readily be seen how an active purulent infection of the middle ear cavity can primarily affect the blood current without first having to travel its usual course through the venous structure of the mastoid bone, the course of infection being through the small communicating veins and lymphatics, or by a process of absorption directly through the thin wall of bone in this region. The symptom of greatest importance is an unusually rapid rise in temperature, from 99 or 100 to 104, 105, or even 106, and quite as sudden as the rise a fall to 97, 98, 99, or possibly 100. The temperature may remain low for several hours, and then quickly rise again to the points first mentioned, to be followed by a rapid remission, and this may go on indefinitely until the end. During the exacerbations of temperature the pulse rate is rapid, ranging from 120 to 170 per minute. There is no chill present. The only evidence of chill found in these patients is that if seen when the temperature begins to rise, they will be found to have cold hands and feet. They are exceedingly fretful and irritable, and later become drowsy. The eye signs are negative. If the temperature range is allowed to repeat itself for several days, the tongue becomes white and dry. During the temperature remissions these patients (and they are usually young children) feel remarkably well, will ask for food and wish to sit up and play with their toys. This is one of the

phases of the disease which the parents and uninitiated find hard to comprehend. They see such an apparent improvement in the little ones that they are misled as to the dangers existing, and often believe they are well on the road to recovery until the next temperature wave occurs. The respirations are only slightly increased.

Diagnosis: The first class of cases is easily recognized, our diagnosis being based upon the temperature changes, the presence of the chill or chilly sensation preceding the rise in temperature, and following an operation upon the mastoid. If most of the symptoms given in this class be present, it is, of course, a comparatively easy matter to make a diagnosis, but if several are absent the diagnosis can be made from those given above. In the cases where the sinus is operated upon at the same time that the mastoid operation is done, and we have no previous symptoms to guide us, we determine whether or not it is necessary to operate on the sinus at this time, by the physical signs which are found present when the mastoid is opened. They are briefly, the presence of a necrotic area of bone over and around the sinus, with usually an epidural collection of pus. The dura covering the sinus wall is either markedly thickened, and darkened in color, or it may present a lusterless appearance, darker at one point than another, and usually the lower end toward the bulb is white or grayish in color. The sinus in some cases is easily compressible, and does not fill readily when the pressure is removed.

Bacteriological examination of the discharge is of value only in that it gives us knowledge of the characteristic infection. Another valuable aid in diagnosis is the blood count, not so much for determining whether a leucocytosis is present, but to determine the polynuclear percentage; as for example, if we find a polynuclear count showing a percentage of over 80, no matter what the leucocyte count be, whether great or small, we are almost certain to find an infective process disturbing the patient's economy.

The diagnosis in the second class, after eliminating all other diseases, is made from the continuous high temperature, and the fact that the patient is not progressing as favorably as he should after an ordinary mastoid operation. A physical sign which I consider of the utmost importance in this class of cases is that when we inspect the wound we find every portion of it apparently doing well, and covered with gran-

ulations, except one point, and that point is the bone forming the sigmoid groove. We will find the bone in this region darker in color than when it was first exposed at the time of operation, and there will be no granulations found upon any part of it. In other words, we have a mastoid cavity showing every evidence of healing except the bone over the sigmoid groove. I have seen this condition persist following a simple mastoid operation for between two and three weeks, where the sinus was involved, or had become involved subsequent to operation. The polynuclear count is of the same value here as in cases of the first class, and should always be made, as a high polynuclear percentage is of the greatest help in determining whether an infective process exists.

In the third class the diagnosis is made almost entirely from the wide temperature range, closely following, as it does, an acute purulent otitis. Bacteriological examination of the discharge is of value only as above stated. The same is true of the blood count, but the utmost importance should be attached to the polynuclear percentage, for if we find it between 80 and 90 it is, I believe, a distinct evidence that our patient is suffering from a septic process. All other diseases being eliminated, the cause of our patient's condition must be referred primarily to the ear.

Treatment: The treatment in the first and second class of cases does not materially differ. Where a diagnosis of sigmoid sinus thrombosis has been made, I believe it is wiser, provided the patient's general condition will admit of its being done, to primarily expose, ligate and resect the internal jugular vein from a point below at the clavicle, to its exit from the skull. Should any of its tributaries be found involved, they should also be ligated and resected well beyond any point of macroscopic involvement. All diseased glands encountered during the resection of the vein should be removed. After this has been done the sinus should be exposed from above the bend down to the region of the bulb, the dura should be opened freely with a scalpel, and the contents of the sinus evacuated. Should we be unable to obtain a flow of blood from the distal end of the sinus, then there should be a still further exposure in this region, and we should proceed backward toward the torcular, or even as far as this channel, until we secure a free return flow of blood, for it we do not obtain a blood current in this region sufficiently free to show that all

obstruction has been removed, our patients subsequently do badly, either from an extension of the infective process to other blood channels, or an encephalitis develops one or two weeks later, caused by an extension from the infective process that we have left in this region. When we remove the clot in the region of the bulb, we will find that in almost every case where the vein has been removed as the first step in the operation, that the so-called return flow is quite as free here as we would expect to find it if we had the internal jugular vein carrying on its usual function, the blood coming, no doubt, from the inferior petrosal sinus. If, as occasionally occurs in this region, we are unable to obtain a return flow of blood, it means that the inferior petrosal sinus is thrombosed, and when such a condition confronts us, we should, provided the patient's general condition will allow it, expose the sinus and remove the obstruction, as otherwise we are courting danger by allowing an infective process to remain here which may at any time cause further trouble for our patient.

The wound in the neck should be flushed with a warm saline solution, a large cigarette drain inserted its entire length, and the soft parts closed by a continuous suture, to within a very short distance of its upper end, and either a wet saline or bichloride dressing applied. This dressing should be renewed at the end of forty-eight hours. At the first dressing the cigarette drain should be drawn out for about an inch and cut off. Subsequently the neck should be dressed once every twenty-four hours in this manner, and at each dressing the drain should be drawn out about the same distance and the end cut off as before, so that at the end of four or five days the entire drain has been removed and primary union is accomplished.

In the third class of cases, the patients being nearly all very young children, the ideal treatment would, of course, be the same as in our other cases, but here we must remember that these cases are caused by a primary infection of the blood current, and when operated upon early the percentage of recoveries is in favor of removing the clot without ligating the vein. For these little patients do not bear prolonged operations well, and it is a matter of much more difficulty to ligate and resect an internal jugular vein in a very young child than it is in an adult, for we have a neck to deal with that is short and chubby, and usually a number of enlarged

glands to encounter, and up to the present time my experience has been not to ligate in these cases, or if ligation becomes necessary to do it at a subsequent operation, where the work can be done rapidly, and not subject these little patients to the added risk of a prolonged operation. It must be said, however, that in this class of cases, where a so-called free hemorrhage is obtained from below, we can never be sure that all infective material has been removed, for, so far, it has been an absolute impossibility to pass a curette from above into the jugular bulb, and in all probability a large number of our cases operated upon without ligation of the vein, have some infective material left in this region, not, however, in such quantity that the system cannot care for it, for were this so these cases would all be fatal. I believe that in the average case of sinus and bulb involvement, it is wiser to ligate and resect the vein, if the patient's condition will admit of it. Certainly in the cases of infected sinus or bulb thrombosis I feel easier as far as the patient's safety is concerned, if this port of entry is obliterated.

In the cases operated upon without ligation of the vein, where they show a varying post-operative temperature curve, it means that there is still some infective material being displaced from time to time. The patients improve notwithstanding, because the major portion of the infective material has been removed, and the system thus strengthened is enabled successfully to care for that remaining.

In young children the time element is one that enters largely into a favorable prognosis, for the shorter the time that we keep our patients on the operating table the quicker will be their convalescence. I am convinced that our results would be better did we operate during the temperature remissions, rather than when the temperature is at its height, for if operation takes place while the temperature is low, certainly the system has more reactive power, there is less depression and a more rapid convalescence will surely follow.

A word about delaying operation in these cases. Eliminate, if possible, all other diseases, and if this is done, then we must return to the original focus of infection, and follow this up in order to determine the cause of our patient's condition.

PATHOLOGIC FINDINGS OF INTRA-CRANIAL COMPLICATIONS OF MIDDLE EAR DISEASES.

BY THOS. J. HARRIS, M. D.

NEW YORK.

When our secretary honored me with an invitation to present a paper on "Pathologic Findings" in connection with this symposium of the intra-cranial complications of ear affections, I was somewhat at a loss how best to proceed in order to avoid a more or less text-book presentation of the subject. After some reflection it occurred to me that an analysis of a considerable number of such cases in the hands of our most experienced American operators might offer food for study and discussion. We do not fail to remember the many valuable contributions along the same line from our European confreres, and especially Koerner's and Macewen's classical works, and yet it seems to us that an independent consideration of the subject might not be without value. To this end we addressed a letter of inquiry to a number of men connected with our largest special hospitals, asking for the following data:

1. Total number of cases of intra-cranial diseases treated, divided as follows:
 - (a) Sinus thrombosis.
 - (b) Meningitis.
 - (c) Encephalitis and brain abscesses.
2. Number of deaths and recoveries, including number of cases operated upon.
3. In how many cases was the pus from the ear examined bacteriologically with the results obtained.
4. Was lumbar puncture made, and if so with what results.
5. Situation and character of the lesion, as determined operatively or by post-mortem examination (meningitis, serous or purulent; thrombosis,—what sinus involved; abscess, single or multiple, where situated; character of pus of abscess when examined.
6. A brief abstract of each autopsy protokol.

7. Antecedent condition of the ear—whether otitis was acute or chronic; whether intra-cranial involvement followed a middle ear or mastoid operation.

8. Result of blood examination when made.

9. Mode of infection, where determined.

In most instances the lateness of the hour at which the letter was sent and the amount of work involved prevented compliance with our request. We desire, however, to publicly express our thanks to Dr. James F. McKernon for his prompt response, and for the statistics furnished by him from the records of the New York Eye and Ear Infirmary, representing, without doubt, the largest amount of such cases treated by any one institution in this country. This report must be, then, of necessity an incomplete one, and is to be viewed rather in the nature of a preliminary one only. It has to do chiefly with the records from the ear department of the Manhattan Eye, Ear and Throat Hospital, and some of the various points considered can be included under "Pathologic Findings," possibly only by the broadest construction of the term.

During the past ten years, 1895-1905, there have been treated in that institution 41,799 cases of ear disease. Of these, 32,486 suffered with disease of the middle ear, and 12,744 cases were of a suppurative nature, acute or chronic. Of these, 32,000 **odd cases of middle ear disease, there are records, more or less complete, of 60 cases of intra-cranial disease, divided as follows:**

(1) Sinus thrombosis	23
(2) Brain abscess	7
(3) Meningitis	30

I. SINUS THROMBOSIS.

Of the 23 cases, 14 died, 9 recovered.

The jugular vein was ligated in fifteen cases, not ligated in eight. Of the fifteen cases where the vein was ligated, six recovered, nine died, all but two from one to twelve hours subsequent to the sinus operation. Of those not ligated, three recovered and six died. It will be seen that in this small series of cases there was no great difference as far as recoveries are concerned, between those cases where ligation was practiced and those where it was not practiced.

In this connection it will be interesting to recall the statistics of Koerner. He has collected 308 cases, with 180 recoveries,

or 58 4-10%. The vein was not ligated in 132 cases, of which 77 recovered, or 58 3-10%. In 94 cases the vein was tied before the sinus was opened, with 56 recoveries, or 53%. In 68 cases the vein was tied after the opening of the sinus with 38 recoveries, or 55%.

While it is true that statistics may be very misleading and the particular conditions under which ligation or non-ligation were practiced in these cases are not stated, it is not without significance that in these cases collected from all sources there is virtually no difference in the results by the different methods of treatment.

Character of the Disease in the Middle Ear.

Acute suppuration existed in seven cases. Chronic suppuration in twelve cases. In one case an acute non-suppurative process alone existed. In three cases the condition of the ear is not stated. In other words, chronic disease was found present in almost twice as many cases as acute disease. This is in line with Hessler's statistics, who found that in 130 cases 99 had chronic middle ear suppuration and 31 acute. Koerner states that his experience is just the reverse. As regards the age, it is noticeable that in only one case was the patient more than 29 years.

Optic Neuritis.

Optic neuritis existed in three cases. This is quite at variance with Koerner's experience, who states that he has never met with a case of optic neuritis in an uncomplicated sinus thrombosis.

In the first of the three cases (case 21) an acute suppuration process had existed for three weeks. Six days after admission to the hospital the patient became stupid and the optic neuritis developed.

In the second case (case 3) the neuritis appeared on the day after admission to the hospital, and was followed by the operation on the next day.

In the third case (case 4) it appeared twelve days after the operation. This was a case of Dr. T. P. Berens, and was regarded by him as a manifestation of hysteria. The group of symptoms, unconsciousness, optic neuritis, vomiting, dilation of the pupil of the side affected and twitching of the left arm and leg, would point strongly, however, to a meningeal irritation. The case recovered.

Temperature: There was nothing particularly significant in

the temperature curves in the different cases. Usually the temperature was high. This, according to Koerner, would be indicative of the septic state, and is borne out by the fact that in ten cases the disease was of such an advanced type that upon admission into the hospital they were in a more or less unconscious state. This would clearly point to the fact that the significance of the symptoms of this dread complication of middle ear disease is not yet sufficiently known to the profession at large.

Chills: Chills were noted in only eight cases. Doubtless careful inquiry would have brought out the fact that the chilly sensations to which McKernon has called attention were present at some stage of the disease in all.

Dysphagia: In two cases difficulty in swallowing was a prominent symptom. A case of Beck is quoted by Koerner where there was paralysis in swallowing due to pressure on the glosso-pharyngeal nerve. This must, however, be a rare symptom.

Complications: Three cases were complicated by cerebellar abscess. Metastasis in the arm was noted in one case. In one a cyst of the liver, not regarded as septic, was found, and in one case an abscess in the pleural cavity. One case (case 4) that of Berens, just referred to, had a paralysis of the trochlea. This, as far as I can find, has never been encountered save in thrombus of the cavernous sinus, which was clearly not present here. It is difficult to account for it. As was stated, the case recovered. Finally, death occurred twice upon the table. These fatalities ought to emphasize the importance of early operation as advanced by von Bergman many years ago. In scarcely one case can it be stated that the operation was performed at an early stage of the disease.

II. BRAIN ABSCESS.

Seven cases with seven deaths.

Situation: In temporo-sphenoidal lobe, six times.

In cerebellum, once.

In three cases there was an antecedent acute suppuration of the middle ear; in the remaining four the process was a chronic one.

This is at variance with Grunert's statistics, where in 91% of cases the abscess followed a chronic otorrhea.

Jansen found in 2,650 cases of acute middle ear suppuration,

brain abscess once, in 2,500 of chronic suppuration, six times. The increased proportion of acute cases in the Manhattan records is to be noted, viz.:

In 3,078 O. M. S. A., three cases.

In 8,722 O. M. S. C., four cases.

Or one in every 1,000 of acute suppuration as compared with one in 2,300 of chronic

The classical mastoid operation was primarily performed in six of the cases, to be followed later by an exploration of the brain on account of the symptoms which developed.

Symptoms: Of the symptoms which were chiefly complained of, pain in the head was a prominent one, and is mentioned in five of the seven cases. In two of these the pain was on the side of the head corresponding to the abscess. In one it was referred directly to the ear.

Vomiting: Vomiting was a prominent symptom in only three, according to the notes of the cases. Whether present in the others, we can not say.

Epileptiform Convulsions: One case had a striking symptom which for a time baffled diagnosis. The history of this case is briefly as follows: (Case 3, H. A., adult, service of Dr. Clemens, admitted April 2, 1902, for pain in her ear of nine day's duration.) A simple mastoid operation had been performed two years before on that side. At the operation which was performed at once on admission, some rough bone was discovered in the antrum, but nothing else, and the wound was closed by silk sutures. Upon the first dressing three days after the operation, the wound was found clean. Three days later the patient became restless, complained of pain in the head, and ten minutes after the dressing had an epileptiform fit. These fits occurred daily. On the ninth day after admission she had nine attacks. The fifteenth day she became stupid and died on the sixteenth day after admission. The autopsy revealed an abscess in the temporo-sphenoidal lobe, containing $2\frac{1}{2}$ ounces of pus. This was located but half an inch from the surface, and communicated by a sinus externally with an erosion discovered on the left temporal lobe near the base. Here an oval spot $1\times\frac{1}{2}$ inch was found showing cerebral softening. The abscess was lined with a pyogenic membrane, which showed numerous fresh hemorrhages. From this cavity another sinus extended to another large abscess just above the fissure of Sylvius. A small perforation 4 mm. in diameter was

found in the tegmen tympani. It is to be added that the temperature was normal upon admission and until five days after the operation and then rose to 101. The pulse ranged between 80 and 100, and from 66 to 90 at the time of death.

Koerner regards convulsions as in no way characteristic of brain abscess. They are usually present in abscess of the cerebrum, and are limited to the extremities and the face of the opposite side. Such marked seizures as occurred in the case just stated we believe, however, are exceptional.

Temperature: Temperature in two cases was normal on admission. According to Koerner again, it can remain so through the entire disease, which is especially wont to be met with in the latent period. The pulse in every case was slow, below 100, even when high fever was present, and below 70 in four of the cases. Koerner regards this symptom as a valuable but unreliable one. This agrees with Schmiegelow, who in a recent contribution on this subject to the *Archives Internationales de Laryngologie* for April, 1905, in which he reports 19 cases of brain abscess of his own, does not find hyperpyrexia a characteristic sign of disease. It may be added that even pain which he regards as the most usual symptom to be met, was absent in two cases.

Cessation of Respiration: In two cases the interesting phenomenon occurred of cessation of the respiration during operation at the time the brain was punctured. In one of the cases the abscess was located in the cerebellum, and in the other in the temporo-sphenoidal lobe. In the first case respiration was maintained artificially for some time, and the heart continued to beat for five minutes. In the second case, one of Dr. Berens, a tracheotomy was performed, and the breathing so restored for three hours. Schmiegelow in the article just quoted, refers to a case of his own where a similar accident occurred. Macewen, in his well known work upon "Pyogenic Disease of the Brain and Spinal Cord," reports two cases of cerebellar abscess where this occurred. Besides these, Schmiegelow refers to one case reported by Barker, three by Sir Dyce Duckworth, one by Hoffer and one by Flies, making in all, including the two cases reported by ourselves, eleven cases where this phenomenon occurred, with only two exceptions the abscess being located in the cerebellum. The cause of this would seem in all probability to be due to a great increase of intra-cranial pressure paralyzing the respiratory center.

Finally one other case is of such unusual interest that we desire to refer to it somewhat at length. Case 4, G. M., age 14, a case of Dr. Kenyon, was admitted March 29, 1900, to the hospital with the history of pain and discharge from the ear for three weeks. The following day a mastoid exenteration was performed. Pus was encountered and a free opening was made into the middle ear through the antrum. In the course of the operation the dura was exposed. The wound was closed by sutures to heal by the contained blood clot. Upon June 2 there was some suggestion of pus in the dressing, and the wound was not uniting properly. June 4 the stitches were removed under ether, the wound cleansed of the granulations which had formed, and packed with sterile gauze. Upon June 10 severe pain was complained of in the forehead and in the side of the head. Ether was again administered and the dura found bulging at the spot previously exposed at the first operation, and was opened. A free discharge of foul pus was obtained. A counter opening was made through the temporal bone and the brain cavity packed. Previous to the operation the right pupil was found dilated to twice its natural size. This phenomenon disappeared after the operation. The wound was dressed by means of gauze drainage, and the boy discharged from the hospital July 30, two months after admission, about well. The bacteriologic examination of the smear from the ear showed a few streptococci. Temperature before abscess was opened was 101 F., and so continued for one week afterward. The pulse before the operation ranged from 96 to 92, gradually falling from 80 to 76, at one time to 66 after the operation. On October 2 of the same year, two months after his discharge from the hospital, he was readmitted because of a return some weeks before of the ear symptoms, and a second operation upon the brain was performed the following day, and pus was found beneath the dura extending forward to the frontal lobe; 2 ounces were evacuated. The wound was packed with plain gauze. The following day the patient was restless and noisy. Three days after the operation of. At the time of dressing, the wound was found clean. For he was delirious, on the eighth day headache was complained the next two weeks constant pain in the head was complained of, requiring the use of morphine. Chills now developed. On about the 31st of October, one month after admission he died.

The temperature was high and of a septic character throughout the disease. Pulse ranged from 30 to 140. No autopsy.

Remarks: Here without much question was a case of infection due to imperfect drainage at the time of the original mastoid operation. Reference will be made later to immunity to danger in most cases where the brain is exposed. This must be regarded as an exception. The second point is the character of the dressing, namely, packing with gauze. Most of our successful operators condemn this as a dangerous procedure. Finally the remarkable slowness of the development of the symptoms must be noted. Such improvement as to warrant discharge from the hospital and the remaining away for two months is certainly a surprising phenomenon.

III. MENINGITIS.

Of the 30 cases of which records are given, 29 died, 1 recovered. Of these six were those of children, two years or under. One was in a child of six and one in a child of eight. The rest were adults. In 15 cases there was a chronic suppuration of the middle ear, in 10 an acute suppuration, in 4 the condition was not given, and in 1 it was apparently healthy.

The bacteriologic findings can be regarded in no way conclusive. In three cases the streptococcus was found, in six the diplococcus, and in six there was a mixed infection. It would only be suggested from this small number of fifteen cases where the results are stated that the mixed infection is of as common occurrence as the diplococcus, and twice as common as the streptococcus.

The lumbar puncture was not practiced in enough cases to permit of any report.

Symptoms: In fourteen cases the temperature upon admission is stated. In nine of these it was normal.

Vomiting was a characteristic symptom in four cases.

Headache was present in nine cases.

Vomiting, according to Barber, can be regarded only as a symptom of intra-cranial disease, and is never solely characteristic of brain abscess, nor yet of meningitis. Among the numerous symptoms a sudden blindness developed in one case the day before admission. At the autopsy miliary tubercles were discovered lining the pia,—the blood vessels of the brain were generally congested.

In one case the symptoms followed a furunculosis of the auditory canal. The *channel of infection* is not definitely stated, except in two cases where it occurred through the tegmen tympani. In one case the symptoms followed an acute abscess of the middle ear, the result of infection through the nose following the use of a Birmingham nasal douche.

Optic Neuritis: Optic neuritis was met in one case. ,

The single case of not fatal result is of sufficient interest to be briefly referred to.

(Case 29.) It concerns a child of two, a patient of Dr. Haskin, who was admitted to the hospital July 7, 1902, for a secondary mastoid operation. A discharging sinus was found over the right mastoid near the tip. At the time of the operation granulations were found in the attic and antrum. The sinus was exposed and found healthy. The case eventually recovered, and was discharged from the hospital three weeks after operation. Two weeks later he was readmitted with a temperature of 104, very restless, with twitching of the muscles of the right arm. The right pupil was dilated and there was slight facial paralysis. The following day, he vomited, and there was a paralysis of the right side. On the 17th he was apathetic, but on the 19th appeared brighter. The mastoid wound looked better. Upon the twenty-third day the paralysis had about disappeared. Upon the 20th of September he was discharged. Later he was readmitted for skin grafting. In personal conversation with Dr. Haskin, this case which he has previously reported, he regards as of a tubercular nature. The child is still under observation. This case suggests the possibility of recovery after the serous form of meningitis. Up to recently such a termination was not entertained, but in the last few years several authorities, Koerner among others, have called attention to this, and a number of cases are on record where such a result apparently has taken place.

Meningitis Following the Radical Operation: Of great interest is the number of cases following the radical operation, ten in all. In these the temperature was normal at admission in all but two. It is a striking fact in what a large number of cases of simple mastoid operations, as well as in the so-called radical operations, the dura is exposed with no unpleasant sequelæ. Rarely is another thought given to it. Indeed it is the practice of some surgeons to go so far as to apply skin grafts

upon the dura at the time of the primary operation. That this can be followed by disastrous results is witnessed by these ten cases. This is still more clearly evidenced by the fact that in cases 4 and 19 the post-auricular wound was not closed at the primary operation, and no symptoms of meningitis developed until two days after the second operation, when skin grafting had been practiced and the wound closed. In the second of these two cases rubber tissue was used for packing the wound at the first operation. Both the sinus and dura were exposed at that time.

That this experience is not limited to the institution in question is shown by the statistics from the New York Eye and Ear Infirmary, where out of twenty-two cases of meningitis, seven followed the radical operation. The writer in a paper read before the Eastern section of this society here in Boston two years ago took occasion to state that this operation must "not be regarded as free from risk to life." This warning note seems amply justified in the light of these nineteen deaths in two institutions following the operation. In the ten years from 1895 to 1905, 1195 mastoid operations were done at the Manhattan Eye, Ear and Throat Hospital, of which some eighty-three were of the radical type.

These startling figures, viz., out of eighty-three radical operations ten cases of fatal meningitis, or one in eight, developed is enough to give us cause for thought, and bids us exercise the greatest care in selection of our cases, in our technique, and in employing the most perfect asepsis. At the same time it is only fair to add that meningitis also followed the simple mastoid operation in twenty cases, or one in thirty-six.

This shows that the simple Schwartz operation can be followed by fatal consequences, but in the case of the radical operation the proportion is vastly greater. The grave question is also raised of the wisdom where the dura is exposed of closing the wound at the first operation, and especially of skin grafting at those points.

Conclusion: In conclusion the writer desires to emphasize the importance of greater attention on the part of the surgeon in charge to the taking and preservation of the histories of his mastoid cases. Too often this is left to the junior house officer, who has had little or no experience, and who is apt to make records of observations which are of little or no value. The only one competent to make the records is the surgeon himself,

and this he can easily do by dictation to the house officer at the time of his daily visit.

Three recommendations in this direction suggest themselves:

First, every special or general hospital with an ear service should have an ear registrar with whom the responsibility for the compilation and preservation of all records should rest.

Second, a card catalogue index should be provided with a cross index according to disease. The following letter will illustrate the difficulty of following out an investigation like this, without some such index catalogue:

"I have delayed answering your letter of March 30 because I wished to see whether it would be possible for me to comply with your request. I am sorry to say that after looking into the matter I find that the data I could give you would be so incomplete and really valueless that it would not be worth the labor necessary. In both the Pennsylvania and Polyclinic Hospital there is no record of cases kept in such a manner as to permit looking up under the nature of the disease, they are all indexed by the names of the patients. One of the assistants in my clinic started to look up the matter, but found that it would involve going over all the different cases admitted to the hospitals in recent years in order to find records of those cases presenting intra-cranial complications. We have no special hospital in this city devoted to ear, nose and throat work, and in the general hospitals the records of the ear cases are mingled with those of the others.

Third. Greater zeal and earnestness should be exercised on the part of the surgeon in charge toward securing autopsies. In this way, and in this way alone can the valuable material of the various institutions where otology is practiced be brought together for study and scientific research.

DISCUSSION.

DR. EDWARD BRADFORD DENCH *Opened the Discussion.*

For the discussion of the subject I have gone over my own operating book rather carefully, and have collected the following statistics:

I have observed twelve cases of brain abscess (nine tempero-sphenoidal, three cerebellar), thirty-eight cases of sinus thrombosis. (primary bulb infection in two), in thirteen of which the internal jugular was excised; twenty-eight cases of epidural abscess, and four cases of meningitis operated upon, eighty-

two cases in all. These statistics are fairly accurate, excepting as regards the statistics for meningitis. Under this heading many cases have escaped observation, as only those operated upon have been recorded.

From these statistics we find that the relative frequency of occurrence of the various intra-cranial lesions has been as follows: Epidural abscess, 34.1%; brain abscess, 14.6%; sinus thrombosis, 46.3%; general meningitis, 4.8%.

Of the sinus thrombosis cases the jugular was tied in 36.8%.

Regarding the mortality of the various conditions, of the twelve cases of brain abscess, three were cured, 25%, and nine died; of the thirty-eight cases of sinus thrombosis, thirty-two, 84.3%, were cured and six, 15.7%, died. In twenty-five cases the internal jugular was not excised, and of those cases where excision was not performed there were twenty-two cures, 88%, and three deaths, 12%. In thirteen cases, the jugular was excised, and of these ten cases, 77%, recovered and three, 23%, died. Of the four cases of meningitis operated upon, one, 25%, was cured and three died, 75%.

Going over these statistics more in detail, and considering, first, the cases of brain abscess, the fatal termination in this class was due to an extension of the inflammatory process to the meninges, either through the subdural space or by way of the ventricles, usually by the latter route.

Of the two cases of epidural abscess which terminated fatally, one case died of diabetes, which existed before the operation was performed, and the second case died of general meningitis, and is reported under the cases of meningitis operated upon. It, therefore, strictly speaking, should not appear in this category.

The greater mortality which appears in the series of cases in which the jugular was excised, simply depends upon the fact that these cases were much more severe than the cases in which jugular excision was not performed. Of the three fatal cases, which followed excision of the jugular, one died of septic pneumonia, which developed the evening after the operation was performed, the case having been under observation only thirty-six hours. A second case died of general sepsis, in which a previous pneumonia prevented early operative interference. The third case died of hemorrhage into the spinal canal, all symptoms of sepsis having disappeared at the time of death, and the wound in the neck having entirely healed by first intention.

Of the three fatal cases of sinus thrombosis, in which excision of the jugular was not performed, one died of diabetes, a second died of pneumonia, and in the third case the cause of death is not recorded.

Of the meningitis cases, one was cured by operation, simply by drainage of the subdural space. In the three other cases, drainage of the ventricles was attempted, and all the cases died.

It should be stated, in regard to these statistics, that three of the cases are repeated in the history; that is, one of the fatal cases of sinus thrombosis, which suffered also from an epidural abscess, is reported as a fatal case in both instances. The same is true of another fatal case of epidural abscess, which was also operated upon later for serous meningitis. The third case, reported in two places, is a case of sinus thrombosis, with excision of the internal jugular, which later developed a meningitis, and which was drained successfully, but the patient subsequently died of hemorrhage into the spinal canal.

From these statistics we find that the two classes of cases which are attended by the greatest fatality, are brain abscess and diffuse meningitis, either of the purulent or serous variety. Epidural abscess and sinus thrombosis, including those cases where the jugular demands excision, need not be looked upon as being of such a very serious character, if the cases are operated upon early.

Regarding the necessity of interference with the jugular vein, in cases of sinus thrombosis, this, I think, must depend upon the condition present in each individual case. In most of the cases which I have seen, the jugular has been excised at the first operation, where extensive thrombosis of the sinus was present, that is, a thrombus extending down into the jugular bulb, and where it was impossible to obtain a free return current of blood after the introduction of the curette deeply into the *bulbus jugularis*. In one instance this was not done because the sinus was completely obliterated, evidently as the result of an old inflammation. This patient made a complete recovery. In a second case a thrombus was found in the sinus during the course of a mastoid operation, the patient having exhibited at no time symptoms of sinus thrombosis. In this instance free curettage was instituted, and although no hemorrhage was

obtained from the proximal extremity of the sinus, it was decided to wait for several days to see if any temperature developed characteristic of septic infection. This patient made a complete recovery, and never had a rise of temperature above 99°, showing that the thrombus in the bulb had become organized, and was not infectious in nature. In a third case, owing to the weakness of the patient at the time of operation, it was deemed inexpedient to excise the jugular at the time of the primary operation. The patient was returned to bed, stimulated freely, and twenty-four hours later, there having been a slight rise in temperature, the jugular was removed. This case made a perfect recovery.

As a general rule, therefore, it has been my practice to consider hemorrhage from the proximal end of the sinus as a contraindication to immediate interference with the jugular.

I am perfectly well aware of the fact that free proximal hemorrhage does not necessarily mean that the jugular bulb is free, but it is rather strong presumptive evidence of this fact. Hemorrhage may, of course, come simply from the petrosal sinus, but certainly, in my own experience, it has seldom been necessary to excise the jugular in cases where there was a free hemorrhage from the proximal end of the sinus at the time of operation.

The statistics must vary, of course, according to the practice of each individual operator. Supposing, for example, that I had excised the internal jugular in the twenty-two acute cases of sinus thrombosis, which were cured without interference with the vein. As the operation upon the jugular is not particularly difficult, although sometimes tedious, these cases would undoubtedly have recovered, and the statistics would have been overwhelmingly in favor of interference with the vein. It seems to me therefore, that the advisability of excision of the jugular must depend upon the conditions present at the time of operation, in any individual case. Where there is evidence of extensive involvement, as shown either by the condition of the patient or by the condition of the sinus, at the time of operation, immediate interference with the jugular is not only advisable, but is strongly indicated.

In cases where but a small thrombus is present, I think it is better surgery to remove the clot, and wait for the development of symptoms.

As to the advisability of suturing the wound in the neck

at the time of operation, I have done this in most of my cases. In fully 50% the wound has healed by first intention throughout; in fully 75% of the remainder, most of the wound has healed by first intention, a small sinus remaining at the inferior angle of the wound for several weeks after operation. In only three cases that I can remember, has it been necessary to reopen the wound in the neck, for its entire length. It has usually been my practice to insert a small drain at the lower angle of the wound, and not to attempt complete obliteration of the "dead space" in the neck caused by the removal of the vein. The upper end of the wound, just beneath the mastoid, is also left open, and a firm packing of iodoform gauze introduced here, in order to isolate the upper extremity of the divided vein from the neck wound, and thus prevent infection of the freshly incised surfaces. I believe, therefore, that excepting in very septic cases, primary suture of the wound in the neck is indicated.

Regarding the frequency of occurrence of sinus thrombosis in acute and chronic inflammations, I can only say that I have seen thrombosis of the sinus in both conditions. While it is impossible for me to give the exact figures from my statistics, I would say that the condition occurred with about equal frequency in chronic and acute inflammations. Some of the most severe cases that I have seen have followed acute inflammation of the middle ear, and I think that this is rather the rule, where the bulb is primarily affected, although I have seen cases of primary bulb involvement in an acute exacerbation of a chronic middle ear inflammation.

Concerning the symptomatology of sinus thrombosis in the typical cases, very little need be said. The characteristic temperature curve is sufficient, in most cases, to enable one to make a certain diagnosis.

The blood count, in these cases, is rather interesting, in that in no case has the leucocytosis been very high unless there has been some secondary septic deposit, either in the viscera or superficial tissues.

Regarding the cases which present an atypical clinical history, that is, those cases which run a continuous high temperature, I have seen one or two such cases. Here the absence of other conditions to account for the high temperature, as indicated by symptoms referred to the abdominal or thoracic viscera, or to the joints, or to the meninges, would, I think,

usually enable one to make a diagnosis, although the diagnosis must, of course, remain somewhat uncertain. In one case, where the only symptom was a continuous high temperature, excision of the jugular, together with clearing out of the lateral sinus, was followed by a complete recovery.

Concerning the advisability of either ligation or resection of the jugular, as the primary step of the operation, I should hardly be inclined, from my own experience, to endorse this procedure. The only reason why the vein should be interfered with, as a primary step, is the danger of air entering the general circulation, upon opening the sinus. This danger is reduced to a minimum if, before the sinus is opened, an assistant places his finger over the internal jugular in the neck. Remembering that the jugular in the upper part of the neck lies just behind the carotid, and that it crosses the common carotid at about the level of the cricoid cartilage, and also, that it is always superficial, firm pressure on the neck in this region will certainly prevent the aspiration of air into the vein at the moment of opening the sinus. While there is no objection to exposing the jugular just beneath the omohyoid muscle, and putting on a temporary ligature, before opening the sinus, such a procedure occupies considerable time. Not so much time is occupied in finding the vein as in preparing the neck, changing the position of the patient, and temporarily covering the mastoid wound, so as to prevent any infection of this from without. In some of these cases the more rapidly the operation is done the better for the patient, and as there are a certain number of cases in which interference with the vein is certainly not called for, it seems wise to me to explore the sinus first, rather than to interfere with the vein before finding out exactly what there is in the sinus.

Regarding the relative frequency of the occurrence of brain abscess, in cases of acute and chronic suppuration of the middle ear, most of my cases have occurred either where there has been a suppurative inflammation of long standing, or where there has been a previous history of an acute inflammation, which, apparently, had entirely resolved. This latter statement seems to me one of no little importance. In one of the fatal cases there was a history of an acute inflammation of the middle ear ten years before. When I saw the patient she was suffering from what appeared to be an acute middle ear inflammation of about two weeks' duration, with a compli-

cating mastoiditis, and yet when the brain abscess was subsequently opened the destruction was too great to be explained by so short a history. In another case, where the symptoms were apparently acute, there was a history of earache a year before, and a second attack about a month before the symptoms of brain abscess appeared. When the abscess is situated upon the right side, localizing symptoms are rare. It seems to me that there the diagnosis must be made upon the slow pulse, either a septic or a subnormal temperature, the septic temperature occurring in the acute and the subnormal temperature occurring in the chronic cases, together with the fact that the patient gradually becomes weaker and weaker, and steadily loses flesh. This gradual wasting away of the patient, without any sufficient reason, in cases of aural suppuration, should always be regarded, I think, with suspicion, particularly if the pulse is slow.

The blood count, in such cases, materially aids in the diagnosis. A high percentage of polymorphonuclear cells, that is, a percentage above 80% or 82%, pointing as it does, to the presence of pus in some part of the body, would be a strong indication for the surgeon to explore the brain, if a suppurative lesion in every other situation could be positively excluded. While a low pulse rate is a valuable diagnostic sign, it must be remembered that it is not always present, or occurs, in many cases, as rather a late symptom.

In cases of acute brain abscess, where the purulent focus is small, the pulse may be increased in rapidity.

Regarding the sudden failure of respiration, at the time of operation, I have seen this occur in one case, in which the diagnosis was only made post-mortem, the case having been operated upon for sinus thrombosis.

Epileptiform convulsions have occasionally occurred in some of my cases, but, as a rule, only in the late stages, and I should hardly regard their occurrence as a symptom indicative of suppuration within the brain.

Regarding the proper method of operative interference in brain abscess cases, I am inclined to think that the otologist occasionally errs in his exploratory operations, from the fact that he seems to consider it necessary to interfere in the direct anatomical region of the ear. Where the localizing symptoms point to a brain abscess, remote from the ear, as for instance, an abscess in Bioca's convolution, it seems absurd to attempt

to open this abscess, either through the tympanic roof or immediately above the external auditory canal. Broca's convolution should be exposed and the abscess drained, independently of the mastoid wound. The same rule would apply to abscesses located in the motor tract, although, of course, these seldom occur, as the result of middle ear suppuration.

In cases where the localizing symptoms are indefinite, or where they are complex, that is, where there are certain ocular, auditory and motor symptoms combined irregularly, in other words, where no definite cortical lesion can be demonstrated, it seems more than probable that the lesion is located in the internal capsule. In such a case, the exploration would be most effective just above and behind the external auditory meatus, as the parts involved would be more easily reached from this region than from any other. It seems to me that cases of drainage through the tympanic and antral roof, should be restricted to those instances where on exposing the dura in this region, the dura is either discolored or presents a fistulous opening. To explore what may be a healthy brain, through a septic field, would seem rather unwise.

Regarding the drainage of these cases, gauze was used in two successful cases, and drainage tubes in another successful case. In future, I shall be rather in favor of the cigarette drain, that is, plain absorbent or iodoform gauze wrapped in rubber tissue, the purpose of the latter being to protect the incised brain tissue from infection by the pus as it passes from the abscess cavity to the surface.

Of the cases of meningitis reported, two followed chronic suppuration and two acute suppuration of the middle ear. In two cases overlooked in preparing the above statistics, meningitis followed a chronic middle ear suppuration.

The operative treatment of meningitis is the most difficult and discouraging problem which presents itself. The character of the infection seems to be immaterial. In the successful case of which I speak in my statistics, the dura was opened and the subdural space drained immediately above the tympanic roof. In this case the temperature fell to normal in the course of two days after the operation, and the patient recovered with no complications. In the other cases reported, in which ventricular drainage was performed, death followed in every instance. In all of these cases, however, the ventricles were involved, so that ventricular drainage was demanded.

In two cases, not included in the above list, lumbar puncture was employed, but both cases terminated fatally.

In regard to what Dr. Harris says about meningitis following the radical operation, I would say that out of 150 radical operations, I have had but five deaths. In one case death was due to pneumonia, in two cases to meningitis, and in two cases to brain abscess. In one of the cases dying of meningitis a primary grafting was done, in spite of the fact that a small area of dura was exposed at the time of the operation. In the second case, dying of meningitis, no skin-grafting operation was performed. The wound was simply packed in the ordinary manner, and allowed to heal by granulation; so that, in this instance, the introduction of skin grafts certainly played no part in the production of the meningitis. In one of the fatal cases of brain abscess, the presence of the abscess being discovered only after death, a primary grafting had been done. The quantity of pus found in the brain, however, clearly showed that the abscess had antedated the radical operation. In the second fatal case of brain abscess following operation, the abscess was acute. In this instance, a secondary skin grafting was done fourteen days after the primary operation. At the time of the radical operation, the dura was not exposed in any locality.

The statistics of Dr. Harris, then, while valuable, seem to show that in a certain number of cases the radical operation is followed by death,—not as a direct result of the operative procedure, but simply from an intra-cranial lesion, which must have existed for a long time previous to the performance of the operation for the relief of middle ear suppuration.

Dr. Wendell C. Phillips, of New York, said that the series of papers just presented very completely covered the subject, and little could be added in the way of criticism. The suggestions they contained and the methods outlined were entirely in harmony with the experience of men who were engaged in this line of work. There were one or two points, however, that the speaker said he wished to emphasize, and one was in connection with Dr. Smith's paper. Statistics showed that injuries to the head were quite frequently associated with attacks of meningitis from middle ear suppuration. Dr. Phillips said he could recall one or two instances in his own series of cases of chronic middle ear suppuration going on for years until the patient received an injury to the head,

and this was followed by an intra-cranial complication. Such a sequence was not difficult to explain. The only barrier between the suppurative process in the ear and the brain was a rather thin plate of bone, and it was quite probable that a severe injury to the head might be the actual exciting cause of the intra-cranial complication.

Dr. Smith, in his paper, tried to differentiate between the different varieties of meningitis, and Dr. Phillips thought that many of the points brought out were correct. As a general statement, it might be said that meningitis, in contradistinction to brain abscess and lateral sinus thrombosis, was more frequently associated with severe and long continued pain in the head. While pain might be present in all varieties, that accompanying meningitis was more intense than that complained of in the other forms of intra-cranial complication.

Temperature could not be relied upon as a characteristic symptom, except that associated with sinus thrombosis. In that condition it was quite characteristic when the sinus had become extensively diseased—not in the early stages. The speaker said he had recently opened a lateral sinus in which the diagnosis was based largely on the temperature variations, ranging from high to sub-normal.

Dr. Phillips said he did not regard the pulse as particularly characteristic of any of the conditions under discussion excepting sinus thrombosis. A rather well-marked chill could also be looked for in that condition, and this was not at all common in the meningitis cases. He did not think a chill could be regarded as one of the symptoms in differentiating between brain abscess and meningitis.

The speaker said he was surprised that greater emphasis was not placed upon the importance of lumbar puncture. He had come to make use of it in practically all of his cases of meningitis, and by making a careful examination of the cerebrospinal fluid the exact character of the intracranial condition could often be determined.

In regard to hernial protrusions following large openings in the skull, the speaker said it was now generally recognized that the main portion of the protruding mass was not brain tissue at all, but granulation tissue, and it could be sliced off to the level of the bone with comparative immunity.

In differentiating between lateral sinus thrombosis and brain abscess, the mentality of the patient often proved a val-

uable and helpful symptom. As Dr. McKernon had pointed out, cerebration was rarely interfered with in the former condition, the mind usually remaining clear until a late stage, whereas with brain abscess we were very apt to get early signs of mental impairment, and the same was true of meningitis.

The fact could not be too strongly emphasized that serious intracranial complications were more frequently observed in connection with chronic than with acute middle ear disease, and this should be regarded as an additional reason why those cases should receive more careful consideration than they did. A minute examination of the histories of acute mastoid cases would often show that they were really complications of chronic suppuration of the middle ear. These patients not infrequently neglected to give a history of former ear discharge, or of previous milder attacks of mastoid involvement. This was an argument in favor of the radical operation in selected cases, where the opinion was well grounded that further local treatment would prove of no avail.

Dr. Harris' paper contained the statement that among thirty cases of purulent meningitis there was one recovery. In that single instance, Dr. Phillips said, the meningitis was probably serous in character. The purulent form he regarded as invariably fatal, and he thought it was useless to operate on such cases. In two instances of supposed purulent meningitis that came under his observation during the past winter, the condition proved to be epidemic cerebro-spinal meningitis. One of these recovered, the other died. These cases had been reported in full at the recent meeting of the American Otological Society.

Dr. Charles W. Richardson, of Washington, D. C., said there were some points that he thought were not sufficiently emphasized in the paper on meningitis. One was, the improbability of any form of treatment being beneficial in pure lepto-meningitis. The Germans had reported good results from lumbar puncture, but those were probably not cases of pure lepto-meningitis. The speaker said he had operated on three such cases without any effect, the patients rapidly succumbing to the disease. This was not surprising, when we considered the character of the lesion in these cases. Masses of purulent exudate covered the surface of the brain, and invaded the interlobular fissures, rendering recovery practically impossible.

In Dr. Jack's excellent paper there was one point that was not sufficiently emphasized, and that was in regard to the aphasia that occurred in the left-sided cases. This aphasia was usually one of the earliest symptoms. Of course, it did not occur in the right-sided cases (excepting in left-handed patients), but when it came on in the course of suppurating ear disease, even without other symptoms, the occurrence of a brain abscess on the left side was very probable.

Dr. Richardson said that in the treatment of the radical mastoid wound, he did not look with favor upon the application of skin-grafts to the freshly exposed dura. He regarded that as a bad method of treatment. The application of skin-grafts was apt to give rise to the development of granulation tissue, and cause unpleasant symptoms. The speaker said he was also opposed to the treatment of the wound by the formation of a blood-clot, as that was another method by which infection could be readily carried into the cranial cavity.

PERSONAL ATTENTION AN ESSENTIAL FEATURE
IN THE TREATMENT OF CHRONIC
AURAL DISCHARGES.

By F. C. Hotz, M. D.

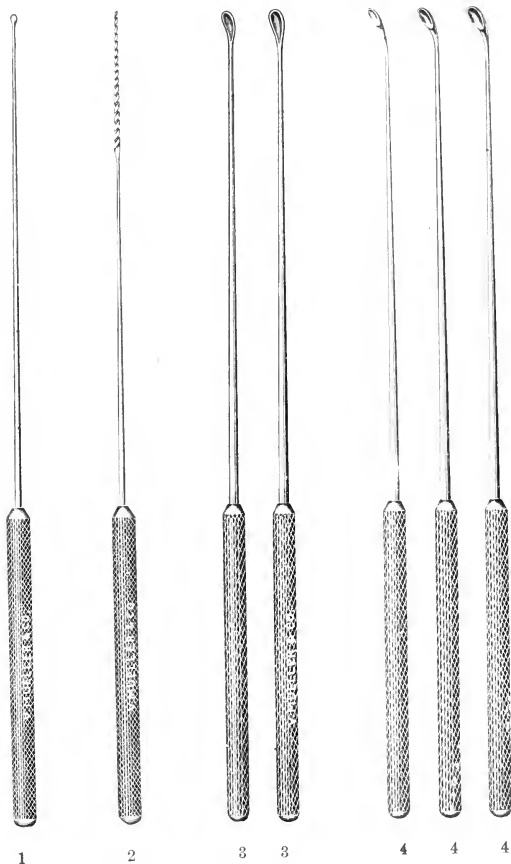
CHICAGO.

Chronic otorrheas present a great variety of conditions. In some cases the discharge is maintained by a simple catarrhal inflammation; in other cases by caries and necrosis; in other instances, the mucous lining is ulcerated or covered by granulations, or polyps are present. Again, the membrana tympani may be altogether absent or show a partial destruction, only, in a perforation varying in size and location.

It is evident that these conditions so different in their nature cannot be treated successfully by one and the same method, but in each case the treatment must be modified to suit the existing conditions. And yet we see quite often the same routine treatment applied to all sorts of cases. The patient, for instance, is advised to syringe the ear every day once or oftener and to drop in afterwards some solution. Now, while injections may remove all the secretions from the tympanic cavity if the membrana tympani is altogether destroyed, they remove only the discharge from the meatus, but do not cleanse the tympanic cavity, if there is only a partial destruction, or if the discharge comes from the attic. Time and again, I have had occasion to demonstrate to my students the inefficiency of the syringe under such circumstances, by removing from the tympanic cavity or the attic large amounts of sticky mucus or even inspissated masses, though the patient, as he assured us, had used the syringe conscientiously every day as directed by his aurist. All that the syringing can accomplish under these conditions is to wash out the meatus, but this is simply a matter of cleanliness and does not affect the disease, for it is the secretion retained in the tympanic cavity and attic, not the discharge in the meatus, which exerts an injurious effect and which we desire to remove.

If the perforation of the membrana tympani is very large, instillation of solutions can reach the mucous membrane and

favorably influence a catarrhal otitis; but they are valueless in the presence of granulations, polyps, caries, necrosis, etc., and they are inefficient even in the simple catarrhal condition



if the perforation is small, because very little enters the tympanic cavity through a small perforation.

I have long since become convinced that this home treatment can accomplish very little in chronic otorrhea, but that excellent results can be obtained—and often in apparently desperate cases—if the surgeon takes the treatment altogether in his own hands and treats the pathologic conditions directly with instruments or medicines as the case may be. To carry out this treatment successfully one must have instruments with which one can reach every nook and corner of the tympanic cavity and attic. The probes, applicators, and curettes usually furnished by the instrument makers are not satisfactory because usually made of steel they cannot be bent to fit the anatomic conditions presented by the different cases. The instruments which I have been using for many years and which have given me excellent service are: 1. A fine probe made of pure silver (Fig. 1) the end of which can be bent short to any angle so that we can explore with it every point of the tympanic cavity and the attic. 2. Applicators made of sterling silver (Fig. 2); the handle is corrugated so that the lightest touch of the fingers can control their movements; the stem is two and one-half inches long and ends in a corkscrew spiral, three-quarters of an inch long, around which cotton can be wound very securely and yet can be taken off very easily. The spiral can be bent like the probe to any suitable angle to carry medicines directly to any corner in the tympanic cavity and attic. 3. Small spoons like cataract spoons (Fig. 3) made of the same material and with the same stem and handle as the applicators. As the edges of these spoons are not sharp but smooth, inspissated matter can be scooped out without any possible lesion to the lining membrane. 4. Small steel curettes (Fig. 4) with a flexible stem so that they can be set at the proper angle for scraping carious parts or removing large buttons of granulations. 5. An attic syringe.

Supplied with these instruments we proceed in every case of chronic otorrhea as follows: The meatus is cleaned out with the cotton on the applicator and after an ocular inspection, the regions not visible (behind remnants of the membrane tympani, the peripheric corners of the tympanic cavity, and the attic) are carefully explored with the probe to ascertain their condition, whether there are inspissated masses, granulations, polyps, carious or necrosed spots.

Carious or necrosed ossicles are removed at once. Inspissated secretions and cholesteatomatous masses are removed

with the silver spoons; the removal is done more thoroughly and rapidly than with the attic syringe, the current of which is not strong enough to dislodge firmly impacted masses; the syringe is used only for the final washing out.

Large granulations are cut off by the curette and large polyps are removed by the snare. The presence of small polyps and granulations, which cannot be seen directly, can be detected and located by means of the applicator; for as they bleed very easily the cotton around the spiral of the applicator will show a blood stain when it is introduced in various directions into the tympanic cavity and the attic and comes in contact with granulations. The granulations or small polyps thus located are then treated directly; for this purpose a very little cotton is tightly wound around the spiral and dipped into deliquesced chromic acid and the spiral is then bent so that it brings the acid in direct contact with the granulations. Under these applications repeated every three days the granulations quickly disappear and often the discharge ceases with their disappearance. If it continues we apply directly and thoroughly over the diseased membrane, by means of the flexible applicator, silver nitrate, protargol, argyrol, camphoroxol or any other medicine called for by the existing conditions. In the same way the ulcerated membrane is treated after the removal of cholesteatomatous masses.

This treatment is continued and the case is not to be considered cured until the cotton applicator shows a perfectly clean condition; that is to say, the cotton rubbed over every part of the tympanic cavity and attic must remain perfectly dry and clean. And this test must be repeated and prove satisfactory at intervals of several weeks after the treatment has been stopped. This is of very great importance; for toward the end of the treatment the secretion is very scanty and forms a thin film of moisture over the tympanic cavity or dries up to thin scabs in the attic. The inspection would find the ear apparently dry and induce us to consider the case cured; exploration with the cotton applicator, however, informs us at once of the true condition by the moisture on the cotton or the little scabs it brings down from the attic.

I am convinced by my experience that this personal treatment yields good results in many cases which otherwise would have to go undergo the radical operation. But there are conditions in which even this treatment would avail nothing and

the radical operation is plainly indicated as, for instance, in extensive caries and necrosis of the tympanic walls or attic. The treatment here outlined does not take up as much time of the patient as one might think; though in some cases in the beginning three treatments per week are necessary for a short time, in the most cases two treatments are sufficient and towards the end of the treatment the intervals between attendance can be made even longer. The regular attendance required of the patient may sometimes cause him some inconvenience, but that is certainly no reasonable excuse for changing our plan for one which might suit the patient better but accomplish less. If we are firmly convinced a certain course of treatment is the road to success we wrong our patient and ourselves if we do not strictly adhere to it, for if we depart from our course the patient will not be benefited and our reputation will suffer by our failure to cure the case.

A few clinical reports may serve to illustrate and prove the merits of the treatment here recommended.

1. *A rather simple case in which the radical operation had been urgently recommended.*—In the beginning of January, 1903, a Miss O., 25 years old, consulted me about her right ear, the hearing of which had been failing during the past four years. One year ago earache for three days, which was followed by a discharge that had continued more or less ever since. Never had any mastoid symptoms, or headaches, or vertigo. During the past four months had been treated by an aurist, who finally insisted upon the radical operation as the only means of a cure. The treatment had consisted in syringing, instillations of medicines and occasional examinations of the aurist. Patient rather delicate, hears loud voice two feet, Rinne negative. Slight mucopurulent discharge of a very bad odor, though the ear had been syringed every morning; an oval perforation in the lower anterior segment of the membrana tympani and tympanic cavity filled with soft easily-bleeding granulations, but the probe carefully passed in every direction failed to detect caries or necrosis. Mastoid region normal. Liquid chromic acid was applied by the applicator through the perforation directly on the granulations twice a week, and on February 12 the tympanic cavity was cleared of all granulations, its lining was smooth and the discharge had ceased. The lady then went to California,

and on her return in June I found the ear still dry and the perforation smaller. I saw her again in October, 1904, and last May and found the ear still in the same satisfactory condition.

2. *Otorrhea of fifteen years, vertigo from impacted dry secretions.*—Mrs. McPh., 42 years old, came to me in June, 1902, with the history of an otorrhea of the right ear of fifteen years' duration. Twice, polyps had been removed. During the last four months she had occasionally slight earache and suffered much from dizziness, especially when the syringe was used. Hears watch at contact and the acumeter at 85 centimeters. Anterior half of membrana tympani absent, posterior half sclerosed, tympanic cavity packed with inspissated matter, the removal of which required several sittings because the manipulations with the silver spoon, though executed with the greatest care and gentleness, were very painful and caused nausea and dizziness. But after all impacted masses had been removed the patient was permanently relieved of vertigo. In the anterior recess of the tympanic cavity I found a mass of granulations so sensitive to the touch of the cotton-tipped applicator that I had to proceed very cautiously with the application of the chromic acid. By the middle of July the granulations had disappeared, the discharge had ceased and the ear could be explored with the probe in every direction without causing any pain or dizziness.

July 1, 1903, the patient returned with a slight discharge; no granulations; no dizziness. The tympanic cavity was swabbed with protargol (ten per cent) every day for one week and then every two days during the next two weeks when there was no more trace of any secretion. The ear has remained well up to the present time.

3. *Case of otorrhea for thirty years, referred to me for radical operation, but relieved by persistent personal treatment.*—In January, 1904, Mrs. O., 58 years old, was referred to me for radical operation. For thirty years her left ear had been discharging more or less; recently she had the constant feeling of a heavy weight on her head and suffered much from dizziness; she was afraid of walking alone in the street, as she was constantly swaying to the right side. No headaches. Hearing reduced to perception of loud sounds; constant noise of escaping steam; membrana tympani absent; necrosed malleus fastened to promontory by cicatricial bands and surrounded by granulations. Tympanic walls covered

with dry crusts under which, however, the surfaces were smooth and pale. The attic was filled with inspissated masses which were so hard and firmly impacted and the most gentle working with the spoons caused so much nausea and dizziness that I had to go on very slowly. It took a whole week to clean the attic, but when it was done the patient was relieved of that heavy pressure on her head and the dizziness was much lessened and disappeared entirely in the course of two weeks. The attic walls were treated by direct applications of silver nitrate and camphoroxol alternately. In February the necrosed malleus was removed and the granulations were destroyed by chromic acid. March 15 the patient was allowed to return home, as during the past ten days the repeated explorations with the cotton applicator had shown a perfectly dry state of the attic.

The patient felt well until the end of November, when the ear began to discharge again and the dizziness also returned. She came back to me on December 29, and I found the tympanic cavity and attic filled with soft, thickened matter. It was easily removed with the spoon and gentle injections with the attic syringe. The discharge from the attic was not profuse, but slightly blood stained, showing an ulcerated state of the lining. Direct applications of silver nitrate (two per cent) quickly improved conditions and in the middle of January the ear was dry again and the patient free from dizziness. The lady called for an examination in February and again in June on her return from a trip to Europe, and on both occasions the ear was found in satisfactory condition.

4. *A rather stubborn case requiring five months of regular personal treatment.*—In 1888 Mrs. B., 52 years, had an otitis media suppurativa, with a discharge lasting five months at the time and recurring at different intervals. I first saw her in 1893, when I found a moderate discharge of mucus from a perforation in the posterior half of the membrana tympani, but the lady was not so much concerned about the discharge from her right ear as about paroxysms of sharp pains behind her left ear during four days, as she feared she was threatened with an inflammation in the left ear as she had in the right ear five years ago. The examination showed normal hearing and normal conditions of the left ear; and as the patient had frequent attacks of rheumatism in her life I suspected these pains behind the left ear were of a rheu-

matic nature and the quick relief obtained by sodium salicylate certainly seemed to confirm my opinion. Between 1893 and this year the lady had a number of such neuralgic attacks, sometimes behind the left ear, sometimes behind the right ear, and they were always promptly relieved by sodium salicylate. Neither ear showed any signs of inflammation at any of these attacks. From 1896 till 1904 there was no discharge from the ear, but it began again in October, and as it continued and became quite offensive, the patient finally made up her mind to take treatment in April of this year.

At that time the discharge was quite profuse, saturating the cotton in the meatus in six hours. Only a narrow rim of the membrana tympani left; malleus and incus gone; walls of the tympanic cavity pale and smooth; the attic very sensitive to the touch of the probe and traces of blood on the cotton of the applicator; no caries or necrosis. Under applications of camphoroxol to the attic the discharge soon lost its offensive character and gradually became less. In May, a few small granulations appeared on the edge of the tympanic wall of the attic; they were exceedingly sensitive, the slightest touch with the probe causing violent pain and the first application of chromic acid causing a profound fainting fit, which lasted over ten minutes. In June, the attic was healed, but there was still some discharge, the source of which I discovered in a mass of spongy granulations in the anterior recess of the tympanic cavity towards the Eustachian tube. On account of the extreme sensitiveness I did not like to use the curette, but applied chromic acid twice a week, the treatment lasting all through July and August. By September 15 at last all traces of granulations and discharge had disappeared and weekly examinations during October and November showed no return of disease.

TUMORS OF THE EAR.*

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Like tumors in other parts of the body, it is best to divide tumors of the ear into benign and malignant. While the former are, as a rule, harmless and require the aid of the physician solely on account of the unsightliness they cause; or on account of the difficulty of hearing which follows if they are seated in the meatus or the deeper parts of the auditory apparatus, the latter, on the other hand, present the same malignant features of this type of growth elsewhere.

If not eradicated, the tumor will either extend superficially over wide areas, or else will travel into the interior of the skull so that even extensive surgical interference will not be life-saving. Such extensive tumors are fortunately of less occurrence now than formerly, for, with the education of the masses and the increasing fear of carcinoma prevalent, the aurist is more likely to see the disease in its earlier stages, when the diagnosis may still present difficulties. Since like in other parts of the skin, a close connection exists between eczema and allied skin lesions on the one hand and malignant disease on the other, the greatest caution will often be in place in giving the proper diagnosis.

Benign Tumors.—Fibroid tumors are common, both as fibroma durum and molle. Their most common site is naturally the auricle, since fibrous tissue is abundant here. A form of keloid may be included among these tumors, which frequently develops from the puncture made in the lobule for wearing ear-rings. This is seen most often in the black race,

*Presented as a Candidate's Thesis to the American Laryngological, Rhinological and Otological Society, Boston, Mass., June 5th, 1905.

which is generally predisposed to the development of scar-tissue. Other forms of fibroids also effect the lobule of the ear most often, yet there are a number of cases on record where the concha and even the meatus were the starting point.

Histologically, the tumor is composed of more or less cellular fibrous tissue. In a few cases on record, the character of the tissue was more embryonal so that the tumor would be more properly termed myxo-fibroma. The base is usually broad, but in the meatus pedunculated growths are occasionally encountered.



Case 1. Lipoma.

The diagnosis is generally easy, yet the harder forms may be mistaken for cartilaginous and even osseous growths. It should be remembered that while fibroid growths may assume a truly enormous size, their growth is generally very slow and painless. A fibro-sarcoma may present the same clinical picture, but the more rapid growth and the presence of more or

less pain will give a hint as to the malignant nature of the tumor.

Of much less clinical importance than fibroid tumors are those whose chief constituent is cartilage. Indeed, most cases described are not true chondromata, but auricular appendages or else mixed tumors of the parotid region which, among other tissues, also contain cartilage. True chondromata are, however, mentioned by Walliczek (*Verhandl. d. deutsch. otol. Gesell.* June, 1897), and by Pollitzer (*Lehrb. d. Ohrenheilk.*).

Osseous growths on the other hand are very common and have been encountered in every form and in almost every part of the auditory apparatus. The following excellent classification is given by W. Kuemmel: (*Handb. d. prakt. chir.* Vol. 1).

(1) *Ecchondrosis ossificans*, similar to the exostoses at the epiphiseal junction of young children. These bony outgrowths are usually conical and are covered superficially with cartilage. They are seen most often in the auditory canal of children and may interfere very much with hearing.

(2) *Exostosis eburnea* and *spongiosa*. The former are usually rounded, the latter more conical, but exceptions are common. It is often stated that these growths take their origin from polypoid masses of granulation-like tissue, but in very many cases this supposed origin cannot be proven.

(3) *Hyperostoses* of the auditory canal usually involve the anterior and lower portions of the canal and give rise to considerable difficulty of hearing. They are manifestations of disturbance in the growth of the bone and sometimes occur as a result of long-continued suppuration. Their removal may be very difficult, owing to their position and their extreme hardness, so that special instruments have been recommended.

(4) Lastly, true *osteomata* are rarely found occupying the spaces of the mastoid process. They are analogous to similar structures in the ethmoid and frontal sinuses and their removal may occasion considerable difficulty.

In the middle ear bony growths are also encountered at rare intervals. In the three cases quoted by Buck (*Diseases of the Ear*, 1896, p. 166), suppurative disease had existed in two.

Fatty tumors belong to the rarest conditions found about the ear. The only cases found in the literature are those of Walliczek (auricle) (*Verhandl. d. deutsch. otol. Gesellsch.*,

January, 1896, p. 263), and of Ole Bull (auditory canal) (Zeitsch. f. Ohrenheilk. Vol. 32, p. 226).

The writer has observed the following case: John T., aged 29, had tumor (size of a bean) of upper external part of left lobule as long as he could remember. Also had a small tumor on the head and one on the right shoulder. Never experienced pain or discomfort of any kind. Examination: Circumscribed, lobulated, soft, fluctuating growth, slipping



Case 2. Papillema.

away when the skin is picked up. Operation: Incision half an inch in length behind the lobule through skin and capsule. Tumor shelled out, skin flap brought in apposition and stitched. No recurrence after three years.

Microscopic findings: Connective tissue strands, forming very wide meshes which enclose typical fat cells. Tumor well circumscribed, capsule thick and firm, vascularization scant. No evidence of malignancy.

Pure myxomata have not been recorded. They are often reported as occurring in the tympanic cavity, but usually they are edematous polyps.

Angiomata are seen most often in children with similar growths in the neighboring parts. About the tragus they are generally plexiform, in other parts of the auricle, cavernous. The former often contain an abundance of young connective tissue and behave like malignant tumors. Cirroid aneurysms occur by preference in the tissue between the lower jaw and the mastoid process. They generally start from the posterior auricular artery and spread over a considerable portion of the head, involving also the mucous membrane and the bone. The clinical importance of all these neoplasms is the great danger of hemorrhage. Sometimes the constant pulsation of the vessels gives rise to very disagreeable noises in the ear so that an extirpation is strongly indicated. Some cases have been reported cured after the injection of drugs which promote the coagulation of the blood, but in the majority of instances excision will be necessary. Severe bleeding may require ligation of the carotid.

Intratympanic angiomata have been reported by Weir and Buck (*Amer. Journal of Otology*, Vol. 1).

True adenomata may start from the sebaceous glands of the external ear, and Jansen has recently operated a small intratympanic growth of this character (*Verhandl. der deutsch. otol. Gesell. Jena*, 7 Versam, p. 120). Strangely enough the glands which secrete the cerumen do not seem to give rise to tumors.

Simple papillomata are rather rare upon the auricle and appear generally as warts. Two interesting cases observed by Buck (*Dis. of the Ear*, 1898, p. 98) belong to this class. In both there was an anomalous development of the epidermis, giving rise to horn-like protuberances springing from the outer and posterior portion of the helix. The length of the tumor was three-fourths of an inch in one of the cases. Complete recovery followed removal. Frequently papillary granulomata are classified among this group, and the very first stages of carcinoma may pose as innocent warts. The following case of wart has been observed by the writer: James R. S., aged 22 years, noticed one year before a small pimple at the opening of the left external auditory meatus. This gradually increased until the patient entered the hospital. It was

very painful to the touch and bled when scratched. Examination: Small tumor, blocking the canal, covered with horny epithelium, that bled when touched with the probe. Tumor removed.

Microscopist's report: Typical papilloma, consisting of a thick epithelial layer thrown into folds, and a scanty vascular stroma, rich in firm connective tissue and elastic fibrils. The margin between epithelium and fibrous tissue is everywhere sharply demarcated.



Case 3. Sebaceous Cyst.

Granulomata, though not properly speaking tumors, may be conveniently discussed because they are at times closely connected with malignant growths. Two cases observed by the writer, pathologically reported granulomata, were later found to be respectively sarcomata and epitheliomata. They are very common in the tympanic cavity, as the result of irritants acting upon an inflamed mucous membrane, such as hair, nails, pieces

of necrotic bone, etc. Microscopically, we are here dealing with the ordinary vascular granulation tissue, generally covered by a rather thick layer of epidermis. They may attain a polypus shape and extend into the meatus, thus interfering with hearing. Since they prevent a free discharge of pus, they will aggravate the suppuration already present, hence their removal is earnestly indicated.

Much difference of opinion exists as to what constitutes a cyst. Pathologically a cyst is a tumor with fluid contents, whose inner surface is lined with epithelial cells. It is, therefore, not correct, in the strict pathological sense, if collections of serous or even sanguinolent fluid, without epithelial lining, be grouped here. There is a form of perichondritis serosa, which is more common in other bones, but is also met with upon the mastoid process and the cartilage of the auricle. There is no evidence of inflammation or of previous traumatism since the development seems to depend upon the effusion solely of serum into the bone or cartilage. True glandular cysts are certainly very rare. The following is an example of a sebaceous cyst observed by the writer: John J. T., aged 42. Twenty years ago was struck on side of head, the ear swelling very rapidly. In about a week the swelling subsided, and the ear assumed natural size. About a week later the lobule began to swell and slowly increased in size until it became the size of a cherry. For twenty years it remained stationary, never giving rise to pain or inconvenience of any kind. In the last months the patient was exposed a great deal to very cold weather. The tumor gradually became softer. Examination: A fluid mass that does not slip away from the skin when pressure is applied. There is but little resistance to the pressure of the fingers, showing the presence of fluid. Operation: Removal. No recurrence.

Microscopic findings: Unilocular cyst, the inner surface of which is lined by a single layer of cuboidal, epithelial cells. The contents are semi-solid and contain fat granules, cholesterol crystals, and cornified epithelial cells.

The hematoma auris seen in the insane is not properly a cystic tumor, for reasons stated above, yet it is often classed with this group.

A class of tumors closely allied to dermoid cysts and of the greatest interest in aural pathology, is termed cholesteatoma (the "Perlgeschwulst" of the Germans). Cruveilhier, Mueller

and Virchow (see v. Bergman, *Handb. der prakt. chir.* 1st edition, Vol. 1, p. 424), looked upon these tumors as heteropic epidermal growths while v. Troeltsch (*Anl. f. Ohrenheilk*, Vol. 4, p. 97) regarded them as accumulations of epidermis which have collected around a nucleus of cheesy pus. There can, however, be no doubt that tumors of the former type do occur. They may be found at autopsies without having given rise to any disturbance during life, as circumscribed rounded masses imbedded in the walls of the tympanic cavity. Their inner structure resembles that of an onion and has a distinctive mother-of-pearl gloss. Suppurative disease of the middle ear is generally present, but Lucae (*Verhandl. d. berl. med. Gesell.*, Vol. 1, 1866), and Schwartze (*Arch. f. Ohrenheilk*, Vol. 41, p. 207), report cases where the tumor was the sole lesion. Clinically they present themselves as tumors of considerable size, which are generally soft and can easily be removed by blunt dissection. Smaller growths sometimes occur in the epitympanic recess and in the antrum and are generally discharged spontaneously through the external auditory meatus by means of the suppuration which they incite. These cholesteatomata should not be mistaken for the products of chronic desquamative otitis media. In the latter case masses of epidermis often form in the recess or in the antrum and soon become saturated with pus. They adhere very firmly and are removed only with difficulty, generally leaving the denuded bone rough. According to Miculicz (Bergman, *Handb. d. prakt. chir.*, Vol. 1, p. 425), true cholesteatomata are a result of the inclusion of epidermal germs in the cavities of the temporal bone during the development of the ear. The differential diagnosis is of the greatest importance, since the treatment of tumor and otitis differs considerably. Most tumors within the tympanic cavity will require a radical operation, while desquamative otitis will generally be cured without an operation. Likewise, the prognosis is not the same, since cholesteatomata may cause very much destruction of bone and secondary meningitis, a complication which rarely occurs with desquamative otitis.

The writer has failed to find the following tumors mentioned in connection with diseases of the ear: lymphangioma, lymphoma, myoma and neuroma. The occurrence of true dermoid cyst is very doubtful; a few cases of atheroma of the auricle have been described (Gruber, *Lehrb. Ohrenheilk*, 2nd

Edition, p. 385), and Gillette reports an oil cyst. (Quoted in Bergman's Handb. d. prakt. chir., Vol. 1, p. 423.)

Malignant tumors may be classified in the following three groups: Carcinoma, sarcoma and endothelioma. All three are characterized by progressive growth, with destruction of normal tissue; a tendency to ulceration and recurrence unless operated upon in the earliest stages.

The most common of the three tumors enumerated is the form of carcinoma known as epithelioma, starting usually from the epithelial cells which cover the auricle.

The cause of epithelioma of the auricle is no better understood than that of epithelioma elsewhere in the body. It is essentially a disease of advanced age, and a history of trauma, frost-bite, etc., may frequently be obtained, without, however, settling the vexed question of etiology. On microscopic examination, the typical proliferation of the surface epithelium into the deeper tissue will be evident. Typical "pearls" may be seen and there is nothing which distinguishes these tumors from epitheliomata elsewhere. In the earlier stages, the tumors may appear as eczema or some other innocent skin lesion and there are few symptoms except perhaps slight pain, disfigurement and a moderate amount of discharge after the tumor has broken down. Later, with involvement of the temporal bone, the pains become more severe and are often located in the depth of the ear and may even simulate a trigeminal neuralgia. Necrotic portions of the bone are soon cast off with the purulent discharge and a pronounced fetor will develop. Soon the labyrinth will be affected and there will be facial paralysis, vertigo and deafness. The subsequent history of the case will depend to a great extent upon the direction in which the growth extends. There is often no distinct tumor, since the tendency to break down is very marked in these growths, so that nothing but a large ulcerating surface may be found. In the latter stages, the inferior maxilla may be involved so that there is pain on swallowing and obliquity of the jaw. Finally the growth will perforate the skull, involve the dura and even the brain tissue. Thrombosis of the lateral sinus is said to be somewhat more common. The internal carotid artery may be exposed by the growth, yet serious hemorrhages are infrequent, since the vessel is already obliterated. Cranial nerves may be implicated and the tumor may extend to the retranasal space or the atlanto-occipital

joint. Death is due to exhaustion, generally after one to three years. The surrounding lymph-nodes are not often involved and metastases on the whole are rare.

The frequency of the condition is given differently by different authors. Thus Connal has seen four cases in 15,000, Brueckner 1 in 3,000, and Habermann one case in 5,000 to 10,000. (Quoted from Lutz, Brooklyn Med. Jl. 1903.)

The diagnosis will present difficulties only in the earliest stages. An eczematous patch about the pinna, lobule or tragus that will not heal with the ordinary remedies, a nodule increasing in size, perhaps with pain or an irregular ulcer, with infiltration, which bleeds easily upon the slightest touch and exposes the cartilage upon its base, should always arouse suspicion. Usually these symptoms are found in patients over 40. T. P. Berens reported two cases before the Eastern Section of this Society, both of whom were under 40 years of age. In doubtful cases it is always well to excise a small piece from the periphery of the growth for microscopic examination.

Carcinoma of the external auditory meatus is very rare. Many of the earlier cases reported are not in reality malignant, for it is a well known fact in pathology that the microscopic appearance of certain benign tumors starting from the skin may closely simulate that of malignant growths. Many reports must thus be excluded despite careful pathological reports.

I have found the following cases in literature, which are undoubtedly instances of carcinoma starting from the external meatus; Jurka (Arch. f. Ohrenheilk, Vol. XXXIII), J. Orne Green (Arch. of otol., Vol. XXII), and R. Haug (Arch. f. Ohrenheilk, Vol. XXXVI). It is impossible to say how frequent the condition is since many cases are only seen after they have advanced so far that the starting point is no longer evident. The external meatus may also be involved secondarily; thus Puck (Dis. of the Ear, p. 414) reports one preceded by carcinoma of the middle ear, and another that originated in the glands of the neck behind and just below the ear. An attempt at removal is generally impossible, since the parts are too extensively involved.

Carcinoma of the middle ear is generally secondary to local eczema or to prolonged suppuration, which so alters the mucous membrane that a malignant disposition is acquired. These

cases are usually very severe since the disease is not recognized in the early stages. Suspicion should always be aroused if the discharge from the tympanic cavity becomes very abundant and foul smelling, and if polypoid masses, which bleed easily, constantly reform after thorough removal. Owing to the small space in which the tumor develops, the pain is generally very severe, and the neighboring parts, especially the facial nerve, are involved very early. There is nothing which offers resistance to carcinoma; even the mastoid process and the rest of the temporal bone are rapidly involved, and the discharge will soon contain bony sequestra. The glands are more rapidly involved than with epithelioma of the external ear, and metastases are on the whole more common.

According to P. Asch (*Das Sarcom. des Ohres*, Inaug. Dissert., Strasburg, 1896), sarcomata of the ear are somewhat more common than carcinomata. Other authors have seen the latter type of tumor more often. There is also a difference of opinion as to which part of the ear is most commonly involved. Kuemmel (*Bergman's surgery*, Vol. 1, p. 427) states that different parts of the auricle are affected often, but the meatus only rarely, while Lutz (*Brooklyn Med. Jl.*, February, 1903) believes that the inner parts of the ear are the most common site. All the different histologic types have been encountered, but spindle-cell sarcoma and fibrosarcoma are most usual. Sometimes foci of ossification are seen. In the middle ear, round cell sarcomata are more common and even myxosarcomata are encountered. Kuhn (quoted from H. Langguth, *Dissertation*, Strasburg, 1896) believes that the presence of mastoid tissue here is due to the persistence of fetal structures which form the starting point of these tumors, but this has been recently denied by Eschweiler (*Arch. f. Ohrenheilk*, Vol. XIV., p. 18). The spindle-cell tumors often take their origin from the periosteum or the perichondrium; the round cell tumors from the submucous connective tissue. It is also possible that a comparatively large sarcoma of the ear is only a metastasis of a smaller, primary one; a case of this kind has been described by Kuhn (*Verhandl. d. deutsch. otol. Gesell.* Jena, 1895, p. 160), where the primary tumor was seated in the inguinal glands. Finally, multiple tumors may occur in different parts of the body, with involvement of the ear. Lymphosarcoma belongs to this type, and also a very peculiar growth, known as chloroma, charac-

terized by the presence of a green pigment (lipochrome), and a blood composition suggesting lymphatic leukemia. The rarest type of tumor occurring in the external or middle ear is the melanosarcoma, containing intracellular pigment. In the internal ear, some forms of gliosarcoma have also been described, originating from the facial or acoustic nerve.

The etiology of sarcoma is just as obscure as in the case of carcinoma. It is probable, however, that embryonal disturbances (the persistence of fetal structures) play a very important part.

The symptomatology of sarcoma of the ear is in the main the same as that of carcinoma. The diagnosis is often very difficult, and the symptoms very manifold with those tumors which start in the inner ear or soon spread to it. A fact to be remembered is that the patients need not be of advanced age; in fact, those sarcomata which could be traced to fetal inclusions were usually observed in early life.

Where the growth is plainly visible to the naked eye, it is generally fungous in character and bleeds very easily. Pain is usually an early symptom and often out of proportion to the size of the growth. The mastoid is involved early and fungous granulations will soon fill up the cells. In the middle ear and the meatus, the growths often appear as polypi, which are accompanied with an acrid, foul-smelling discharge and which reappear very rapidly when removed. It cannot be emphasized too strongly that all such polypi should be subjected to a microscopic examination, since many errors in diagnosis will thus be avoided.

Growths of the tympanic cavity are soon complicated by deafness, paralysis of the facial nerve, and enlargement of the glands of the neck; while with tumors of the inner ear there will be in addition, vertigo and paralysis of the different nerves at the base of the skull. (Abducens, trigeminus, vagus, glosso-pharyngeus and hypoglossus.) Later the growth extends into the brain and may give rise to hemiplegia. According to Hartman and Haug, sinus-thrombosis (see Bergman, *Handb. d. prakt. chir.*, Vol. 1, p. 428), meningitis or brain-abscess do not occur, but secondary involvement of the temporal bone is not infrequent, Politzer (*Lehrbuch d. Ohrenheilk*), Haberman and others. (*Arch. f. Ohrenheilk*, 1897, p. 15.) Death usually occurs from cachexia, less often from hemorrhage, since even the larger vessels are thrombosed.

Sometimes the ulcerated surfaces permit the entrance of germs, and thus predispose to a sepsis.

The differential diagnosis between carcinoma and sarcoma has more theoretical than practical value, since the treatment for both conditions is the same. It is to be remembered, however, that the latter growth is more common in early life and that it forms larger tumors, while cancer is more prone to ulcerate. The prognosis is generally more hopeless in sarcoma than in carcinoma.

A few words are in place here concerning that peculiar tumor known as chloroma. An excellent article by Rosenblatt and W. Risel may be found in the *Deutsch Arch. f. Klin. Med.* Vol. 72, No. 1. The disease is usually symmetrical and accompanied by exophthalmos. The tumors affect the temporal bone more often than the immediate parts of the ear. If one of the swellings is incised a green pigment is discovered, the exact nature of which is not yet clear. Operation is not indicated since the growths are multiple and closely allied to lymphosarcoma and leukemia.

The distinction between endotheliomata and carcinoma or sarcoma is more of a pathologic than a clinical one, and no doubt many more cases would be on record if careful pathologic examinations would be made in every instance. Kuhn (*Verhandl. d. deutsch. otol. Gesell. Jena, 1895, p. 160*) speaks of two cases; in both, the auricle was the primary seat, but one was secondary to a similar tumor of the forehead. The tympanic cavity was primarily affected in the cases of Leutert (*Verhandl. der deutsch. otol. Gesell. 1895, p. 160*), Rasmussen and Schmiegelow (*Zeitsch. f. Ohrenheilk, Vol. 15, p. 88*). Many authors do not group endotheliomata among the malignant growths since their development is often slow and the cure complete and lasting after extirpation. They may, however, become malignant quite suddenly, hence should be treated as carcinoma. The prognosis is good, and of the cited cases only one was fatal after many years, owing to extension to the brain. The pathologic structure resembles that of sarcoma, but especially at the periphery the origin of the cell-strands can often be traced to the endothelial cells lining the lymph-channels. Lutz (*Brooklyn Med. Jl., February, 1903*) also includes angiomata among the malignant growths. They have already been discussed among the benign, yet it is true that the proliferation of vessels may sometimes erode

neighboring structures. In the truly malignant types, however, sarcomatous elements will generally be discovered on careful examination.

Syphilitic tumefactions hardly belong to a treatise on tumors of the ear, but are mentioned briefly since they may resemble true tumors. Gummata are of extreme rarity, yet when present they may be multiple (Baratoux), they form smooth red tumors with a peculiar elastic feel, the central portion will break down and discharge pus. An excavated ulcer with indurated edges will be the final result.

The cervical glands are enlarged more constantly, a syphilitic history may usually be obtained and other specific manifestations are quite common. Lupus vulgaris and leprosy attack the region of the ear.

Strawbridge (Trans. of the Amer. Otol. Soc., 1878) reports a case of lupus of the auricle, and Neumann (Monatssch f. Ohren., 1869) states that the auricle is the favorite seat of this disease. Of late, however, no cases are reported in this locality. Lupus may be symmetrical in development or unilateral. The favorite point of selection is the lobule, which soon becomes converted into a bluish, dependent tumor, soon agglutinating to the cheek. With the subsequent ulceration the auricle may disappear entirely, or else become converted into a shrunken mass. The meatus is very often occluded by the process.

In leprosy the lesions are rarely isolated, but may usually be found upon the rest of the face. All three varieties (tubercular, macular, and anesthetic) have been described affecting the ears. There is nothing distinctive of the lesions here.

128 West 59th St.

XLIX.

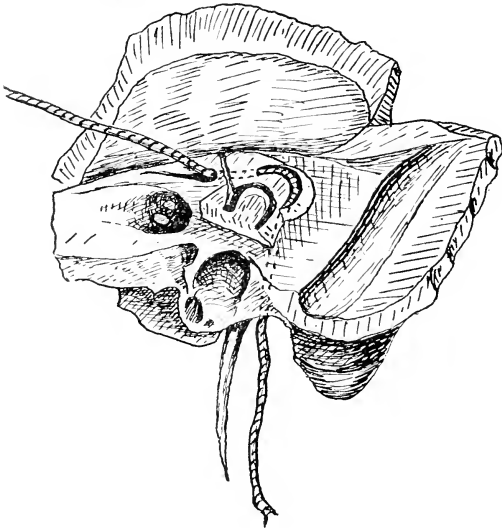
AN INTERESTING ANOMALY OF THE FACIAL CANAL.

A. J. PRENTISS, M. D.,

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OTOLOGY, UNIVERSITY OF IOWA.

Perhaps the anomaly depicted in the two sketches submitted may interest the aurists.

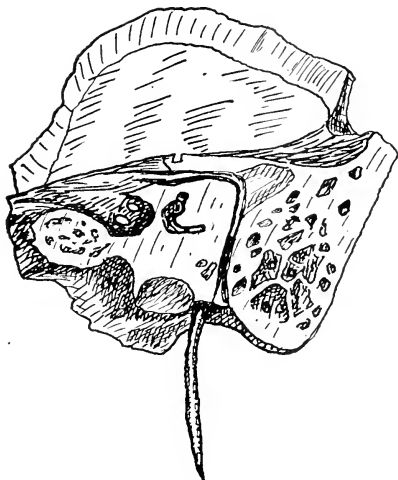
In Figure I a thread has been passed through the facial canal. It is observed that the entrance is in the posterior surface of the petrous portion of the temporal bone rather than in the internal auditory meatus.



The canal passes cortically dipping under the superior semicircular canal and in the same vertical plane turns, passing downward to terminate at the stylo-mastoid foramen. It,

therefore, has no relation whatever with the middle ear or antrum.

In Figure II is shown a vertical section through the facial canal. Three-eighths of an inch above the stylo-mastoid foramen is observed the opening of a small canal which takes the



usual course, passing above the foramen ovale and ending in the hiatus fallopii. Probably this is the passage of the large superficial petrosal nerve, the chorda tympani and the nerve to the stapedius muscle.

L.

A NEW METHOD OF TYMPANIC MASSAGE BY MEANS OF METALLIC MERCURY.

BY JOSEPH C. BECK, M. D.

CHICAGO.

The usual methods of tympanic massage employed are: tragus; Siegel's otoscope; Delstanche's pump; the various pumps for pneumatic massage; by means of vibrators, as recommended by Zander; Lucae's probe; the various methods by the tympanic route, such as politzerization and catheterization; by means of the various tone-producing instruments, as recommended by Urbantchitsch, Marriage, and others; by means of tuning forks, as recommended by Hartmann and others. Weaver, of Chicago, recommended the use of a vibrator which is introduced into the Eustachian catheter, fitting the Eustachian tube.

In 1901, A. Foges, of the Gersuny's Clinic, of Vienna, published an article in the *Wiener medicinische Wochenschrift*, page 625, in which he described the use of metallic mercury in the treatment of adhesions of the uterus to the rectum, by allowing a quantity of from 500 to 1,000 grams of metallic mercury to rest in the posterior cul de sac in the Trendelenburg position, and reported a number of cases cured by this method.

After reading this article, it occurred to me that, if I could introduce a quantity of mercury into the middle ear and in that manner influence the adhesions of the tympanic membrane and ossicles, so as to loosen them, that procedure might give us some results in the large number of cases of adhesive inflammation of the middle ear. This procedure, however, being impracticable, or, rather, impossible, I inverted the experiment by allowing the mercury to flow into the external auditory canal and made the following observations: At first I constructed a simple apparatus for experimenting (Fig. 1) and that one I have continued to use all through, not having been able to improve upon it.

- In order to prove the motility of the ossicles by this method, I made the following experiment. A patient who had a history of chronic catarrhal otitis media adhesiva died suddenly of cardiac trouble and the post-mortem was made to ascertain positively the cause of death. After the brain was removed, and, while the body was examined by the pathologist, I was given the privilege of using the head for my experiment. I chiseled off the tegmen tympani, in that manner laying bare the attic and ossicles. A thin wire was passed between the malleus and incus and another at the incudo-stapedial joint. Then thin strips of paper covered by a smoked surface, such as is used in sphygmographic tracings, were placed opposite these wires, which were bent slightly at the extremities. Now, with the apparatus fitting close into the external auditory meatus, and allowing two ounces of mercury by weight to fall against the tympanic membrane, we observed the movements of the ossicles by tracings. The apparatus consists of a glass



tube, about four inches long, three-quarters of an inch in diameter. The open end is drawn towards the point, the opening measuring from an eighth to a quarter of an inch in diameter. At this end we can either put a piece of rubber tubing, as in the Siegel otoscope, or the flange, as one finds on the Burnett otoscope.

The metallic mercury should be clean, preferably double distilled. We used two ounces by weight. A small cork is necessary to stop up the tube when not in use, as it is easy for the mercury to be spilled out. After using the mercury for a while the glass becomes covered with a dirty gray surface on the inside, which requires either that the mercury be changed or that the tube be wiped out with a cotton swab.

My experiments, which date from June 1, 1904, were carried out by my assistants, Drs. Goldberger and Hughes, under my direct supervision, and also by myself.

I selected for these experiments cases of chronic inflammation of the middle ear, wherever the two cardinal complaints

were present, namely, marked reduction in the hearing and very annoying tinnitus aurium. I preferred such cases as had been under treatment for a long time, without any marked benefit. I might say, in passing, that most of them had been under my treatment previously by the various methods, as inflation by catheter, use of bougies, pneumo-massage, general systemic and hygienic treatment; and wherever an obstructive lesion existed in the nose and wherever the throat presented an influence on the ears, these conditions were met with by the necessary local or surgical interference.

The therapeutic use of heat to the tympanic membrane has been recommended by many authors, the claim has been made that it does good in the class of conditions described above, and I have found by the aid of metallic mercury I can obtain any degree of heat I wish for a short period of time. Consequently I have been using it heated in the following manner: I have found that when the tube is held over an alcohol lamp until I count thirty slowly (40 seconds), the chemical thermometer introduced into the mercury at this time indicates a degree of heat 180° F. By moving the tube, shaking the mercury for four or five seconds, it will cool off to about 150° F., at which time it is allowed to flow in the ear and strike the tympanic membrane. The heating of the mercury evolves pure vapor of the same, which can be seen, as said before, as a dark coating on the glass, and I believe that mercury vapor in that state is easily absorbed by the tympanic membrane, particularly when it has been irritated by the compression of the mercury. I, therefore, claim that this method has a three-fold therapeutic purpose, namely, (1) mechanical; (2) thermal; (3) chemical.

The technique of tympanic massage by this method is summarized as follows:

1. The ear should be thoroughly examined before this treatment is instituted for perforation, accumulations of cerumen, and long hairs about the meatus.
2. Remove cork and heat tube over the alcohol flame, as indicated.
3. Incline the patient's head to the side to be treated, and fit tube tightly into the external auditory canal, like a Siegel otoscope.
4. Slowly (particularly if it is the first treatment) allow the mercury to flow into the canal, leaning the patient's head to the opposite side.

5. Supporting the patient's head with the right or left hand, and holding the tube tightly in the canal, pulling the auricle over the tube in such a manner as to straighten the canal, and moving the head from one side to the other, laterally, at a faster and faster gait. In that manner will the mercury strike the tympanic membrane with sufficient force.

6. If both ears are affected, two tubes are introduced simultaneously, and both tympanic membranes are massaged at the same time.

7. Delstanche's pump or Siegel's otoscope as well as inflation follow this treatment.

8. The number of excursions to be made are governed by experience, but it is well to start with five and increase to twenty-five at the next treatment. Usually, after about six weeks to two months, I discontinue the treatment and, after the same lapse of time, start up again for the same period.

9. After each sitting one should look into the external auditory canal for retention of particles of mercury, and when such are present they can, as a rule, easily be dislodged by shaking the head and moving the auricle. Should they remain, they will cause no untoward symptoms, or complications.

Some interesting observations that I have made while using this method of treatment: A patient who had a small perforation of the tympanic membrane in the lower half was treated by one of my assistants by this method, who noticed shortly after that the patient became very dizzy, and this continued for two days. By the use of the Siegel otoscope I was able to discover in the upper margin of the perforation a small globule of mercury, and after dislodgement of the same the patient was entirely free from dizziness.

Another patient who had a very large perforation, and a very patent Eustachian tube, so that whenever his ear was irrigated water would flow freely through into the pharynx, was treated for experimental purposes by allowing a quantity of mercury to flow into his auditory canal, and small particles of the same would pass into the pharynx.

A patient who had a severe earache was entirely relieved by allowing a small quantity of hot mercury to flow into his ear, and remain for a minute or two.

Another patient, who had a large mass of inspissated cerumen, which resisted the usual method of removal by washing, was treated by permitting a quantity of hot mercury to flow

into his ear and remain for a few moments. Again the douche was resorted to and the mass came out very readily.

In conclusion, I wish to say that I have not achieved any wonderful results by this treatment, nor do I consider it a panacea for all ills, but simply as an experiment of some practical value. I have tabulated the cases which are in themselves not at all interesting, numbering about 250 cases. Improvement of tinnitus aurium followed in most of the cases, except where a general constitutional disease was the cause of this symptom, namely, arterio-vascular changes.

So far as the hearing is concerned, the cases that heard a low scale of the tuning fork were much improved, and in those that showed any involvement of the labyrinth, the improvement was comparatively *nil*, or purely suggestive.

Since I first presented this subject in St. Louis, last February, at the Western Section of the American Otological, Laryngological and Rhinological Society, several gentlemen who have been using this method have found practically the same results as I have. I have never found a case that could not tolerate the treatment, nor one that claimed he was worse after using it.

There is one case of an ear specialist who has been treating himself by this method. I wish to describe the details and the results obtained. Dr. A. T., 39 years old, had double suppurative ear disease when a boy; both ears healed up with treatment followed by a marked cicatricial condition of the tympanic membrane. The main symptom was marked tinnitus aurium, not influenced by inflation, massage, internal medications of bromids, hyoscin, pilocarpin, etc.; this was moderately benefited by the use of this method of treatment (metallic mercury).

I discourage the use of this method on the part of the patient himself as home treatment, nor would I use it indiscriminately without first examining the ear for perforations, etc.

92 State Street.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINOLOGIC AND LARYNGOLOGIC LITERATURE.

I—EAR.

Experimental Studies in Regard to the Action of Fowler's Solution of Arsenic on the Ear.

ALBERT BLAU (*Archiv. für Ohrenheilkunde*, July 31, 1905). Arsenic and its compounds produce clinically and experimentally demonstrable actions in a number of different organs. According to Lewin the following division may be made:

On the skin: dermatitis, urticaria, erythema, acne, and herpes zoster.

In the intestinal canal: burning sensations in the mouth and throat with a feeling of dryness and irritation, stomatitis, nausea, vomiting, etc.

In the kidneys: polyuria, albuminuria, and hematuria.

In the upper respiratory passages: coryza, epistaxis, laryngitis, and bronchitis.

In the central nervous system: dizziness, headache, motor disturbances, and paralyses. Pathologically, with other changes such as ulcers, etc., hemorrhages have been found and, according to Henschel, myelitis. On the part of the ear, according to Rossbach and Nothnagel, ulceration in the external canal is occasionally seen in cases of chronic arsenical poisoning.

Haug believes that changes may occur in the middle ear with deafness, and with or without subjective noises.

The author's experiments were made as follows:

1. Six white mice were inoculated with 1-3 of a Pravaz syringe full of Fowler's solution. After $\frac{1}{2}$ or $\frac{3}{4}$ of an hour, mild convulsions developed and symptoms of paralysis, at first in the fore, and then in the hind feet. As soon as the first symptoms of respiratory paralysis appeared, the animals were killed.

2. Three guinea pigs were poisoned with increasing doses of Fowler's solution during several days, i. e., November 4, each 1-3 Pravaz syringe full; on the 6th, the same amount; on the 8th, $\frac{1}{2}$ syringe full, and on the 10th, $\frac{3}{4}$ syringe full. Two hours after the last injection, the pigs showed the same symptoms as the mice. They were also killed shortly before death by dividing the great vessels in the neck.

Four mice and three guinea pigs were then so treated that the entire head was immersed in Formalin-Müller's solution, for twelve or twenty-four hours. Then the entire ears of the mice, and the labyrinths of the pigs, were placed first in the same solution, then hardened in alcohol and imbedded in celloidin.

The results of the experiments proved that the specific action of arsenic on the ear must be regarded as not producing hemorrhages. Its action is purely toxic. No hemorrhages were found in the labyrinth; on section of the animals, small petechiae were found in the pericardium and on the pleura.

The author, however, was enabled to determine definite changes in the ganglion cells of the ganglion spirals as well as the ganglion scarpae. They consist of changes which involve the protoplasm. In the mice, which had all been treated with single doses, changes were found in the ganglion scarpae and ganglion spirale, as well as in the ganglion cells of the cerebellum. Several cells were found in which the entire protoplasm had taken on a diffuse, dirty color. In the guinea pigs, which had been treated with four doses, with long intervals between each, the greatest changes were found. The majority of the ganglion cells were found destroyed.

In conclusion, the author states, that arsenic certainly produces distinct changes in the nervous labyrinth parts. Because of the absence of other changes in the labyrinth, we must conclude that the rarely observed clinical disturbances, such as subjective noises and slight deafness, are caused by the above described changes.

Inflammatory changes undoubtedly belong to the cases of chronic arsenical poisoning, as also appeared to be proved by the author's findings in the ganglion spirale. *Theisen.*

Some Considerations Regarding Ligation of the Internal Jugular Vein on Account of Ear Disease.

DUNDAS GRANT (*Journal of Laryngology*, September, 1905). The value of ligation of the jugular is questioned. Collateral circulation always exists. Suction into the veins of the head after such ligation has been observed. Stasis is in any case favored, leading to the formation of thromboses and even of cerebellar abscesses. Even in the case of healthy veins, such ligation has occasionally been followed by fatal results, edema of the brain occurring as the result of a narrow jugular on the opposite side. Where there is a clot in the

jugular bulb, Grant recommends, after removing all disease from the mastoid cells, turning out the broken-down clot from the lateral sinus with a margin of healthy clot on either side. Where we have a breaking down of the clot, or pyemic symptoms assert themselves, the vein is to be tied as high up as possible above the facial vein's origin. The ideal place, entirely impossible, would be where the inferior petrosal empties. In no case is ligation to be practiced apart from proper surgical attention to the lateral sinus.

Pathologic Changes in the Labyrinth Found in Chronic Suppuration of the Middle Ear.

POLITZER (*Archiv. für Ohren.* Vol. 65, p. 161).

A report of a series of ten radical operations, which resulted fatally, where the inner ear was studied by means of serial sections. All the cases had been tested functionally before the operation.

This series represents a portion of the 8.9% of fatal cases in Politzer's clinic following the radical operation. Changes of all degrees were found, including the presence of pus and the loss of bone to a greater or less extent. This was most marked in the promontory wall where the bone was seen bored into, pierced with holes or eaten away. The diagnosis is difficult or impossible in many cases where there has not been actual exfoliation of the cochlea. The so-called labyrinthine symptoms of vertigo, nystagmus and vomiting can be lacking, and, even when present, must be regarded as only an aid in diagnosis, as they can occur in irritation of the meninges or brain as well as in certain middle ear affections with intact labyrinth. In the ten cases, vertigo and nystagmus were noted only once. This is to be explained by the preservation in part of the auditory nerve. Adler's symptom was confirmed, i. e., vertigo vomiting, also at times the pulse rate was relieved when the patient was placed on the diseased side in labyrinthine disease, and on the sound side in cerebellar abscess. Of still greater value in diagnosis are the tuning fork tests—Weber's (even though exceptions exist) and especially Schwabach's (reduction of bone conductions in labyrinthine disease). Politzer believes much can be done surgically for these cases. Where the indications exist, the surgeon is justified in freely opening the labyrinth to secure drainage.

Harris.

Primary Jugular Bulb Thrombosis in Children as a Complication of Acute Purulent Otitis Media with a Report of Cases.

McKERNON (*New York Medical Journal*, July 1 and 8, 1905). Five cases are reported in detail, all terminating successfully after operations on the sinus. McKernon believes the infection takes place through the floor of the tympanic cavity. The diagnosis is based on excessively high temperature with great remissions occurring in connection with an acute purulent otitis. Weight is also attached to polynuclear percentage, which, if between 80 and 90, is indicative of a profound infection. The jugular was not tied in any case. The author regards time as an important factor in operating and feels that a jugular ligation would have prolonged the operation to a fatal result.

Harris.

Symptomatology in Acute Otitis in Children.

KERLEY (*New York Medical Journal*, July 8, 1905). In 72 cases seen by Kerley fever was the one striking symptom. Pain was absent in 50 cases, or 69%.

Harris.

II—NOSE AND ACCESSORY CAVITIES.

..

Experimental Irrigations of the Maxillary Antrum.

K. M. MENZEL (*Archiv. für Laryngologie und Rhinologie*, Bd. XVII, Heft III, 1905). Investigations were made for the purpose of determining whether it was possible to infect the frontal sinus in cases of empyema of the maxillary antrum, by irrigations of the antrum. Menzel was induced to try these experiments by a statement made by Lermoyez, that in irrigations of the antrum of Highmore, in which the irrigating fluid was injected with more or less force, some of the pus could be carried into the frontal sinus by way of the hiatus semilunaris.

Lermoyez has reported two cases in which affections of the frontal sinus developed during the treatment of an empyema of the maxillary antrum, and two similar cases are reported by the writer. The results of his experiments made on cadavers are briefly as follows: the irrigating fluid injected through an opening into the antrum of Highmore only reached the frontal sinus where an external opening had also been made into the sinus. In all the trials made, in which no external

opening was made into the frontal sinus, there was not a single instance in which any of the irrigating fluid even when forcibly injected into the antrum, reached the frontal sinus. In the majority of the cases not even any fluid penetrated to the anterior ethmoid labyrinth.

In conclusion, the author states, that a direct infection of the frontal sinus in the way described by Lermoyez cannot take place, even in very forcible irrigations of the antrum of Highmore, because the sinus being filled with air, will not allow the entrance of any of the irrigating fluid. *Theisen*.

The Histology and Origin of the So-called Bleeding Polyp of the Septum.

EMIL GLAS (*Archiv. für Laryngologie und Rhinologie*, Bd. XVII, Heft 1) reviews the literature and gives the result of his own investigations.

(1) The so-called bleeding polyps of the septum are new formations of inflammatory origin, which are produced in the presence of certain conditions of the mucous membrane (*rhinitis sicca anterior* with atrophy of the glands). Proof of the inflammatory origin is afforded by the histological picture (granulation tissue, intra-epithelial foci of leucocytes, coagulation, necrosis of the uppermost layers, numerous plasma cells).

(2) The histologic structure of the bleeding polyps of the septum is an exceedingly various one, nevertheless the chief constituents of these growths are granulation tissue, and new formed vessels and sinuses. According to the relative proportion of these elements, these growths are called granulomata or angiomatous tumors.

(3) Bleeding polyps of the septum are genetically related to *rhinitis sicca anterior* (as is also the perforating ulcer of the septum). Proof of this is afforded by the histologic findings, since we see reproduced in these tumors all of the histological peculiarities characteristic of *rhinitis sicca anterior* (a substance resembling keratohyalin penetrating into the deeper cell layers, pigment of hematogenous origin, numerous epithelial connective tissue or the formation of a sub-epithelial plasma cells, much hyalin cell degeneration and horny changes in the upper cell layers).

(4) Bleeding polyps of the septum are dependent chiefly on a basis of atrophic mucous membrane, which is characterized especially by two peculiarities, namely, atrophy of the sub-epithelial connective tissue, or the formation of a sub-epithelial hemorrhagic zone, with atrophy of the glands, which should normally occur in large numbers, at the point of localization of these tumors.

(5) The vulnerability of these tumors is explained by the following factors: first by the intimate deposit of keratohyalin-like layers in the epithelium, second by the atrophy of the sub-hemorrhagic zone, third by the disproportion between the elastic tissue and the vascular tissue, fourth by the coagulation-necrosis occurring in the upper layers.

(6) The question why *rhinitis sicca anterior* develops at times into bleeding polyp of the septum, and at times into perforating ulcer of the septum is answered by the writer as follows: while in the case of perforating ulcer the tissue is penetrated by micro-organisms, in bleeding polyp of the septum, on the other hand, these are found only in the uppermost layers of necrosed portions. In the first instance, progressive necrosis arises by bacterial invasion, in the second the irritation gives rise to inflammatory new growths. An important role appears to be played here by the behavior of the glands. If the atrophic process has attacked the glandular layer, an important agent favoring bacterial invasion is lost, and there is a development not of retrograde changes, but the formation of granulations, which give rise to bleeding polyp. If, however, the atrophic process of the anterior septal mucous membrane is not far advanced, and if especially the glands with their broad channels of exit are present, then in predisposed individuals, a progressive necrosis develops which ends with perforation of the cartilaginous septum.

Goodale.

Leptomeningitis Following Killian's Operation on the Frontal Sinus.

MERMOD (*Archiv. Internat. de Laryngologie*, July-August, 1905). The case was that of a man of 59, who had had sinus suppuration for many years, with several operations on the maxillary and sphenoidal sinuses. In the course of the Killian's, the intersinus septum was slightly opened. The right sinus, the seat of the disease, showed intact walls and was

full pus and granulations. The ethmoid cells were cleaned out,ⁱ⁾ but the sphenoid were not touched. The evening of the second day symptoms suggesting apoplexy showed themselves, although there were no paralyses. Death occurred on the fourth day. The autopsy showed a general lepto-meningitis of the convexity and base, *except on a level with the anterior ethmoid-frontal region*. Here on both sides, the roof of the orbit, cribriform plate, the dura which covered them—also the pia—showed not the slightest sign of infection. This showed itself first 1 cm. posterior to the sella turcica. The field of operation looked healthy in every particular. In the mass of the second convolution of the right temporal lobe about 2 cm. behind the anterior pole, a hemorrhagic area was found filled by a black clot. Microscopic sections of the walls of the sphenoidal sinus, the cavernous sinus and its nerves, the wall of the frontal sinus and the roof of the orbit did not reveal anything of pathologic interest.

The author, without being able to point out any error in operative technique, nor a sufficient explanation for the meningitis, feels it must be in some way due to the operation.

The Adenopathies in the Affections of the Nose and Rhinopharynx.

GELLE (*Archiv. Internation. de Laryngologie*, July, August, 1905). A valuable contribution to this important subject, deserving to be read in full, is the work of Most in 1901 and Cuneo and André in 1905. They have completely revised our views on the anatomy of the lymphatic system. They have shown that the lymphatics of the nose lie in the layer immediately beneath the epithelium. The system is a rich one especially in children, where the mucosa is thickest. This is particularly the case at the free borders of the turbinals. Contrary to the former theory, the vessels, while varying much in size and form, have walls completely closed. Two systems are recognizable, one corresponding to the respiratory and one to the olfactory area. They are quite independent of each other. The vessels of the two nostrils communicate freely with each other, with the lymphatics of the outside of the nose and the face and posteriorly with those of the pharynx and larynx. Finally, the lymphatics of the olfactory zone, representing the upper third of the septum and nasal walls, are easily injected by the meningeal route. These facts suggest

an explanation for the cases of meningitis which have followed cauterization of the middle turbinate, as well as the glandular involvements of face and neck following nasal infection. An abundant series of afferent and efferent ducts exist for the collection of the lymph and its proper transportation. One reservoir is situated close to the mouth of the Eustachian tube, explaining the infection of the tube and ear following a similar infection in the nose.

The glands outside the nose, but in direct communication, are numerous. Three layers exist in the parotid gland—superficial, deep and those situated between the gland and the wall of the pharynx. Besides these must be mentioned the submaxillary, 5-6 in number, the retro or lateral pharyngeal, two in number in the infant, but atrophied in the adult, and the glands of the internal jugular region.

The lymphatics of the accessory sinuses have not been fully studied, but it is generally believed that they have direct or indirect communication through their bony walls with the lymphatics of the cranial cavity. This question of naso-meningeal communication is, however, still to be settled. The second part of the paper is devoted to the clinical side of the subject. Attention is directed to the necessity of determining, in the case of a given adenopathy, its lymphatic connections and supply. The intensity of the gland infection need not at all correspond to the degree of local disease. Adenitis can develop from a simple acute rhinitis. The streptococcus pyogenes is usually accountable, with or without staphylococci associated. The solution in the continuity of the mucosa can be recognized in certain instances; at other times nothing is to be seen. Occasionally in furuncles of the alae, or in impetigo, we will note submaxillary adenitis. In connection with this, a purulent rhinitis and keratitis interstitialis is often favored. Such glandular inflammation will occur, also, following surgical work on the nose or throat. While adenitis rarely follows a simple acute rhinitis, it is common to see it following an attack of acute inflammation of the nasopharyngeal lymphatic growths.

Erysipelas of the nasal mucosa as a primary affection is met with not rarely. It is characterized by fever, chills, frontal headache, frequent epistaxis, dryness of the nose, mucopurulent secretion, crusts and external congestion of the mucosa. Here a stiffness of the neck, with pain, due to an adenopathy of the neck is of diagnostic importance.

Nasal Diphtheria, primary in nature, is associated invariably with an unilateral adenopathy, which can be recognized as one or two glands, at the angle of the jaw, rolling under the fingers. In an ordinary rhinitis, this is absent, or, if present, is bilateral.

The *retro-pharyngeal* abscesses can develop in the course of a rhinitis, or pharyngitis, however slight.

Ganglionic fever is especially dwelt on as an affection of the glands in early childhood, of nasal origin. A healthy infant is seized, often suddenly, with fever, loss of appetite, and obstinate constipation. No organic disease discoverable. A few days later, difficulty in moving the head is detected, and in the neck a glandular swelling, which is unilateral and situated at the angle of the jaw, as a rule. The gland is hard to the touch, painful and varies greatly in size. The adenopathy continues for several days and then gradually subsides, usually without suppuration.

Glandular swellings can occasionally develop in the course of an acute sinusitis. Finally attention is directed to the adenopathy in the course of syphilis and tuberculosis of the nose, including primary lupus. The author closes with the interesting observation that primary, malignant disease of the nose, whether sarcoma or epithelioma, is, as a rule, not associated with any adenopathy, especially in the early stages.

Harris.

Nasal Obstruction and Nutrition.

FRIEDENBURG (*New York Medical Journal*, April 22, 1905). The effect of faulty nasal respiration upon digestion and nutrition is too often overlooked. It may be the sole cause in the infant where, in consequence of mouth breathing, much air is swallowed with the milk. While, in the older child, it serves to produce "bolting the food whole." The author lays much stress, after operation, upon careful training in restoring proper nasal respiration, and advises for this gum chewing, gymnastics, singing, speaking, and, at times, chin bandages.

Harris.

III—PHARYNX.

Pharyngitis Sicca and Chlorination.

CHAUVEAU (*Archives Internat. de Laryngologie*, July-August, 1905). An attempt to assist in the knowledge of the pathology by report of a case. A man of 62, clerk, presented himself for intense dryness in

mouth and throat, and complained of a band around neck, which disturbed deglutition. The diminutive quantity of saliva was very acid. Teeth all right. Examination of pharynx did not show any disease, granulations, or varicosities. The mucosa had a sombre color. It was dry, of a varnished appearance. Reflexes of palate and pharynx abolished; examination of urine showed no sugar or albumin. No organic trouble. All medication and treatment was without avail till a quantitative test of the urine was made, which showed the proportion of chlorates decidedly below normal. It was impossible to account for this till it was learned that on account of a previous eczema, the patient ate no salt. A hyperchlorate diet was at once ordered, with the most remarkable result. In three weeks the pharyngeal mucosa became rosy in color, much more humid and the saliva reappeared. Taste came back. In a word, all symptoms disappeared.

Harris.

IV—LARYNX.

Two Cases of Primary Erysipelas of the Larynx.

L. BLUM (*Deutsche medicinische Wochenschrift*, September 7, 1905) reports the two following cases in which a facial erysipelas followed the laryngeal affection, so that there was no question as to the diagnosis of the laryngeal condition:

Case I. Pregnant woman, aged 35 years, complained of much pain in swallowing and difficulty in breathing. Patient's face was cyanotic and an inspiratory stridor was present.

The pharynx was somewhat reddened and was free from membrane. A few, small, light yellow blebs were present on the mucous membrane of the hard and soft palate. The uvula was not edematous, and was freely movable. Patient could not open the mouth well on account of severe pain in the right maxillary articulation. Glands in the neck were enlarged and tender to the touch. The right side of the neck was also swollen. Voice was aphonic. A laryngeal examination could not be made, but on examination with the finger, the epiglottis was found very much thickened, but there was no fluctuation. Patient was given 4,000 units antitoxin and cold applications were applied to the neck.

Two days later, a facial erysipelas developed, starting in the ears and extending over the face. Breathing was now much improved. The spleen was enlarged. A laryngeal examina-

tion could now be made, and the epiglottis was found to be still reddened and swollen. Vocal cords slightly reddened. A purulent otitis media of the right ear, and a left otitis externa, developed. The further history of the case is of no great interest.

Case II. Girl, aged 18 years, had been hoarse for two weeks with bloody expectoration. Dyspnea marked. Pharynx not reddened. Sputum was decidedly pneumonic and contained many pneumococci, but no tubercle bacilli. The Gruber-Widal test was negative. Leucocytes 9,000. On laryngeal examination, the epiglottis and laryngeal mucosa were found reddened. Four days later, the pharynx became involved, the mucous membrane of the entire mouth being very red. There was a yellow deposit on both tonsils which were much swollen. The spleen was enlarged. Throat cultures showed no diphtheria bacilli but many streptococci. A week later, a facial erysipelas developed, starting in the right nostril and extending over the face. The throat symptoms were much improved while the process was extending over the face. In conclusion, the author states, that the diagnosis of primary laryngeal erysipelas often presents difficulties, particularly as the condition is so uncommon.

Theisen.

A Contribution to the Origin of Cysts of the Epiglottis.

KAHLER (*Archiv. für Laryngologie und Rhinologie*, Bd. XVII, Heft 1) divides cysts of the epiglottis into two classes dependent upon their etiology. In the first group we find retention cysts, comprising the greater number of these tumors. This group probably includes also those which have been described in catarrhal affections, as translucent glassy cysts with mucous contents. In the second group we find the embryonal cysts, the origin of which may be explained in two ways. On the one hand, they may be considered of entodermal origin, and on the other hand, they may be considered as arising from the branchogenic system, especially if we bear in mind Gegenbauer's view of the origin of the epiglottis from the fourth branchial cleft. The thyro-glossal duct or the embryonal thyroid tissue has nothing to do with the origin of epiglottic cysts.

Goodale.

Unilateral Affections of the Vocal Cords.

A. ROSENBERG (*Archiv. Internat. de Laryngologie*, July-August, 1905). A report of three cases where only one cord was involved and yet the favorable termination showed the condition was entirely a benign one. The appearance was that of intense redness—sometimes vivid, sometimes sombre, thickening and difficulty in movement. Such a clinical picture is usually suggestive of a specific trouble.

In tuberculosis, Rosenberg states that the redness is less pronounced, the contour less altered, ulceration is often present. From syphilis it is distinguished by the sombre redness and the regularity of thickening, in addition to the general stigmata of syphilis.

Carcinoma is to be recognized by the gradual increase of the redness, which in catarrhal laryngitis is only of moderate intensity. At first only a small segment of the cord is involved; also restricted movement is not so noticeable. *Harris.*

V—MISCELLANEOUS.**Chlorid of Ethyl Anesthesia in Laryngologic and Otologic Practice.**

NEUENBORN (*Archiv. für Laryngologie und Rhinologie*, Bd. XVII, Heft 1) agrees with the results found by Chaldekott (*British Journal Children's Diseases*, February, 1904) in his work on ethyl chlorid in comparison with other narcotics.

(a) Advantage over laughing-gas. The narcosis is quieter, and without symptoms of suffocation, opisthotonus and jactation. There is no elaborate apparatus necessary, the anesthesia lasts twice as long.

(b) It has the following advantages over ether. It is pleasanter; complete anesthesia is attained much more rapidly and without excitement; there is no excessive secretion of mucus; it leaves behind no unpleasant taste and smell; the after-effects are, in general, much slighter.

(c) It excels chloroform in the following particulars: It can be given in any position of the patient; anesthesia is adduced much more rapidly and comes without excitement; it can be given in definite amounts; it is much safer; the after-effects are slight or absent.

To this should be added that ethyl chlorid has many advantages over ethyl bromid; it is much pleasanter; there is no stage of excitement; there are no unpleasant phenomena

such as apnea and convulsions; the after-effects are much slighter: patients do not fear narcosis subsequently so much as with bromid ethyl; erotic manifestations are absent or come only occasionally.

Goodale.

The Histologic Relation of Paraffin to Living Tissues in Man.

ESCHWEILER (*Archiv. für Laryngologie und Rhinologie*, Bd. XVIII, Heft 1). As the result of histologic investigations, the writer concludes that the fate of injected paraffin is a complete disappearance, and replacement by connective tissue. This requires a long time, since in the case examined marked phenomena of reaction and absorption were found at the end of a year. It is not yet decided whether the disappearance of the paraffin is by solution in the fluid of the body or through fine subdivision.

Goodale.

The Surgical Treatment of Facial Paralysis.

FURET (*Revue Hebdomadaire de Laryngologie*, August 12, 1905). Ballance, in 1895, was the first to practice the anastomosing of the facial and the spinal accessory nerves for this affection, but Furet, in 1898, was the first who described the operation when he performed it in connection with Faure. Since then it has been done twenty-five times in all—eighteen times the spinal accessory was chosen and eight times the hypoglossal nerve. As a whole, the results have been satisfactory. In only six cases was there no improvement. This improvement consisted, in the largest degree, in increased tonicity of the muscle and so in decrease of the facial deformity. This applies only to the period of repose. When the muscles are in activity, the asymetry returns. When the spinal accessory is the nerve which is anastomosed, this occurs also during movements of the arm and shoulder of the corresponding side. Education, however, will, in a measure, serve to overcome this. On this account, Furet advises choosing the hypoglossal in preference. The lingual hemiatrophy which follows is not permanent, nor even constant. The increased difficulty of the operation is only apparent. Often the hypoglossal trunk is larger than that of the spinal accessory. An additional argument in favor of this choice is the close proximity of the centers of the facial and hypoglossal.

Improvement after the operation begins about the sixth month,

Harris.

New Histologic Investigations Upon the Final State of Paraffin Injected into the Human Tissues.

BROECKAERT (*Revue Hebdomadaire de Laryngologie*, August 19, 1905). After a careful study of the question, the author arrives at his former conclusion, that solid paraffin is encysted in the tissue and is not absorbed. Upon its introduction a reaction more or less violent is produced. Leucocytes try to penetrate into it. Infiltration is, however, exceptional. A sort of phagocytosis occurs, which gradually subsides. When the soft paraffin is used, the reaction is greater. Here may be produced, around the separate drops, a condition suggesting a tumor, or, as it may be called, a paraffinoma.

Harris.

Laryngopharyngeal Polypi.

BOTEY (*Revue Hebdomadaire de Laryngologie*, August 26, 1905). Botey describes a rare form of neoplasm, of which he has observed several cases, which springs from the anterior wall of the pharyngoesophageal wall. In structure, they are simple polypoid cysts, produced by retention of their mucous contents. Because of their peculiar situation, they in time develop a long pedicle, in one of the cases reported, sufficiently long to permit the tumor to protrude from the mouth during vomiting. At times they produce symptoms of intense dyspnea. Dysphagia, nausea and vomiting are frequent. Usually, because of their situation, they cannot be seen with the laryngoscopic mirror. Removal is easy by means of forceps and scissors during vomiting. Hemorrhage is not to be feared.

Harris.

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